

One Size Does Not Fit All: A Multilevel Exploration of Job Demands and Stress Experiences Mediated by Basic Psychological Needs and Double-Moderated by Job Resources

by

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Table of Contents

List of Appendices	iii
List of Tables	iv
List of Figures	v
Acknowledgements	vi
Abstract	1
One Size Does Not Fit All: A Multilevel Exploration of Job Demands and Stress Experiences Mediated by Basic Psychological Needs and Double-Moderated by Job Resources	2
“‘What is stress?’”: The Development of our Understanding	5
Job Demands-Resources Model	12
“‘Why do we experience stress?’”: Basic Psychological Needs Satisfaction	16
“‘Why am I experiencing stress but you aren’t?’”: Individual Experiences of Stress	21
Model Summary & Hypotheses	28
Method	30
Procedure	30
Sample	31
Instruments	33
Variables	36
Analytic Plan	37
Results	41
Preliminary Analyses	41
Analyses	52
Alternative Models	73
Discussion	75
Contributions to Practice	81
Contributions to Knowledge	83
Limitations and Future Research	84
Conclusions	90
References	92

List of Appendices

Appendix A: Survey Communications113

Appendix B: Monte Carlo Simulation Power Analysis..... 117

Appendix C: Participant Report..... 124

Appendix D: Demographics.....127

Appendix E: Questionnaire on the Experience and Evaluation of Work (VBBA).....131

Appendix F: Basic Needs Satisfaction at Work Scale (BNS-W).....133

Appendix G: Maslach’s Burnout Inventory-General Survey.....134

Appendix H: Giessen Subjective Complaints List.....135

Appendix I: Mental Health Inventory (MHI-5).....136

Appendix J: Hypothesized Multilevel Structural Equation Model.....137

List of Tables

Table 1: Means, standard deviations, and t-test results comparing usable data and drop outs.....	42
Table 2: Descriptive statistics across time points.....	43
Table 3: Intercorrelations among demographic and composite within-person variables.....	43
Table 4: Intercorrelations and reliability estimates among the study variables.....	44
Table 5: Means, standard deviations, and ANOVA results among the demographics by group.....	47
Table 6: Means, standard deviations, and intercorrelations among the study variables for the industrial group.....	48
Table 7: Means, standard deviations, and intercorrelations among the study variables for the law enforcement group.....	49
Table 8: Variance explained through model building for the law enforcement group.....	53
Table 9: Full model estimates of the strain outcomes for the industrial group.....	55
Table 10: Variance explained through model building for the law enforcement group....	67
Table 11: Full model estimates of the strain outcomes for the law enforcement group....	69
Table 12: Alternative models R-square values for strain outcomes across times points.....	74

List of Figures

Figure 1: Moderated job demands-resources model.....	14
Figure 2: Hypothesized mediation of the job demands-resources model and basic needs satisfaction.....	24
Figure 3: Standardized path coefficients for the industrial group.....	56
Figure 4: Interactions of resources-moderated job demands on basic needs satisfaction for the industrial group.....	57
Figure 5: Interaction of between-person resources-moderated job demands on physical health for the industrial group.....	59
Figure 6: Interaction of between-person resources-moderated job demands on mental health for the industrial group.....	59
Figure 7: Interaction of between-person resources-moderated basic psychological needs satisfaction on physical health for the industrial group.....	60
Figure 8: Interactions of resources-moderated basic psychological needs satisfaction on mental health for the industrial group.....	61
Figure 9: Within-level moderated mediations paths on strain outcomes for the industrial group.....	65
Figure 10: Standardized path coefficients for the law enforcement group.....	70
Figure 11: Interaction of between-person resources-moderated basic psychological needs satisfaction on physical health for the law enforcement group.....	71

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Abstract

One Size Does Not Fit All: A Multilevel Exploration of Job Demands and Stress Experiences with Basic Psychological Needs and the Double-Moderation of Job Resources

By Lauren H  l  ne Florko

Abstract:

This study aims to explore the link between stressors and strain at work by examining individuals' experiences of stressors over time. The link between stressors and strain was evaluated with the job demands-resources model. Why people experience the stressor-strain phenomenon was evaluated with self-determinism theory; specifically, satisfaction of basic psychological needs. These needs were examined as a mediator, whose fulfillment was predicted to result in lower strain. That is, it is not necessarily job demands that give rise to strain, but the lack of satisfaction of basic psychological needs. An explanation of why individuals experience stress differently was examined through a dynamic model utilizing multiple time-points and double-moderation. Resources were hypothesized to attenuate the negative relationship of demands on basic psychological needs satisfaction and the negative relationship of basic psychological needs satisfaction on strain outcomes. This model was tested between- as well as within-persons with a weekly 5-week diary study with multiple study groups. The result of this novel approach to examining the relationship of basic psychological needs satisfaction within the job demands-resources model suggest that not all stress is equal. The model was supported in one organization but not the other. Resources played a vital role in satisfying basic psychological needs, and thereby, reducing strain outcomes, particularly at the individual level. Basic psychological needs satisfaction was found to be a mediator with one study group, potentially explaining why individuals feel stressed. Overall, this research demonstrates that it is important to examine stress both across individuals but also compared to the individual's own baseline. Implications and future research suggestions for individualized interventions are provided to help reduce the impact of workplace stress and provide practical solutions on how to satisfy employee's basic psychological needs.

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One Size Does Not Fit All: A Multilevel Exploration of Job Demands and Stress Experiences with Basic Psychological Needs and the Double-Moderation of Job Resources

Workplaces are an opportunity to provide employees time structure, financial security, social contact, collective effort and purpose, social identity, and regular activity—all of which promote positive well-being (Warr, 1987). However, workplaces are also a source of stress, as seen around the globe. In the United States, 26-40% of employees report being extremely stressed or burned out (National Institute for Occupational Safety and Health, n.d.), in the European Union, 28% of employees reported feeling stressed at work, and in Japan 63% of employees reported serious work anxiety or stress (Harnois & Gabriel, 2000).

While some employers believe stress to be a “necessary evil” to remain productive and profitable in today’s global economy, research indicates otherwise (National Institute for Occupational Safety and Health, n.d.). Stress is associated with increased absenteeism, tardiness, and intentions to quit, and decreased motivation, productivity, and health—all of which impact the corporate bottom line (The National Institute for Occupational Safety and Health, n.d.; Leka, Griffiths, & Cox, 2004). These impacts are estimated to cost \$50-\$100 billion a year in the United States alone (Edwards & Rothbard, 1999; Gibson, 1993; Sauter, Murphy, & Hurrell, 1990) while costing \$6 billion in Canada (Smetanin, Stiff, Briante, Adair, Ahmad, & Khan, 2011). Worldwide these costs could total up to \$187 billion, with 70%-90% of those relating to productivity costs (Hassard, Teoh, Visokaite, Dewe, & Cox, 2018).

On top of these impacts of stress, long-term consequences to worker health can arise. Gibson (1993) suggested that stress could contribute up to 90% of health symptoms and disorders. Long-term stress-related disorders can manifest as psychological disorders (e.g., depression, anxiety, post-traumatic stress disorder), emotional disturbances (e.g., dissatisfaction, fatigue, tension), maladaptive behaviours (e.g., aggression, substance abuse, accidents, injury, suicide), physical illnesses (e.g., cardiovascular disease; cancer; ulcers, decreased immune system, neuroendocrine disorders, autonomous nervous systems, blood pressure, blood lipids, uric acid), and cognitive impairments (e.g., sleep disorders; Edwards & Rothbard, 1999; Harnois & Gabriel, 2000; Houtman & Jettinghoff, 2007; Hurrell, 2001; NIOSH, n.d.; Sauter et al., 1990; Shirom & Ezrachi, 2003). In addition to negatively impacting workers' quality of life, these long-term disorders can lead to even greater impacts on corporate profitability. For example, increased use of short- and long-term sick leave and temporary or permanent replacement and retraining of skilled employees costs Canada \$3.5 billion annually (Williams, 2003) and mental-illness, overall, costs \$14 billion. (Stephens & Joubert, 2001). In the United States, depression alone costs \$30-\$44 billion due to absenteeism, loss of productivity, and other workplace behaviours (Conti & Burton, 1994; Kessler, Barber, Bimbaum, Frank, Greenberg, Rose, Simon, & Wang, 1999), and in the European Union, the total annual costs are €118 billion (Sobocki, Jonsson, Angst, & Rehnberg, 2006).

Given its pervasive negative impacts to individuals, corporations, and society, workplace stress has been one of the most frequently studied phenomena in organizational research (Swider & Zimmerman, 2010). This has resulted in a variety of

theories, or explanations, as to its causes and consequences (Daniels & Guppy, 1994; Elsass & Veiga, 1997; Ganster, 2008). For example, research has examined job environments, demographics, personal preferences, job demands, resources, needs satisfaction, physical health symptoms, mental health symptoms, to name a few variables. Stress models have brought clarity in understanding facets of workplace stress. We now know there is a distinction between stressors and strain, that stress is a subjective experience, and this subjective experience interplays with the external job environment. However, the large variety of stress models have also added unnecessary complexity and confusion to the literature (Daniels & Guppy, 1994). For example, some stress models define stressors as distinct events where there is a transaction between events and stress responses, while others define stress as ongoing work conditions where there is a dynamic process between the person and their environment (Hart & Cooper, 2002; Ganster, 2008). Only recently researchers have begun to evaluate these different models against one another to understand their differences and similarities (e.g., Rydstedt, Devereux, & Sverke, 2007; Siegrist, 1996; Siegrist, 2002; Siegrist & Marmot, 2004; Tsutsumi & Kawakami, 2004).

Overall, this dissertation aims to (1) outline what stress is; (2) review research as to why people may experience it, and; (3) evaluate why one person experiences stress differently than another. Specifically, this research aims to discuss the evolution of stress models to ultimately build the understanding we have of stress today using the job demands-resources stress model (Demerouti, Bakker, Nachteiner, & Schaufeli, 2001). Then, to better understand why people experience stress at a psychological level, basic psychological needs satisfaction, derived from self-determination theory (Deci & Ryan,

2000), was evaluated. These two components will be combined to understand why individuals experience stress both compared to others and compared to their own average stress week-to-week. Unsatisfied basic psychological needs will be posited as the underlying reason why individuals experience stress within the job demands-resources model, with resources acting as a buffer between the relationship of demands and strain. A dynamic model will be tested to further understand how one experiences stress when their own demands change, and why some individuals experience strain and others do not when under identical demands.

“What is stress?” The Development of our Understanding

First, let's review what the literature says about what stress is. Although workplace stress has been studied for decades, there is no one agreed upon definition of stress (Ganster, 2008; Hart & Cooper, 2002). Lazarus (1966) defined stress broadly as “a universal human and animal phenomenon, [which] results in intense and distressing experiences and appears to be of tremendous influence on behaviour” (p. 2). That is, stress is a subjective phenomenon which is constantly changing based on changes in the person and the environment (Lazarus, 1990). Within a workplace context, the National Institute of Occupational Safety and Health (NIOSH, n.d.) describes stress as the “harmful physical and emotional responses that occur when the requirements of a job do not match the capabilities, resources, or needs of the worker” (p. 6). Over the years, stress has been studied as an independent variable (stimulus-based models), a dependent variable (response-based models), and as a process (Cooper, Dewe, & O'Driscoll, 2001). Most definitions agree that workplace stress is a process whereby work conditions produce negative consequences in well-being (Ganster, 2008). Some commonalities

found within the literature are that stress is subjective, does not exist in a vacuum, and is ever-changing.

Over the span of more than half a century, many theories have been developed to describe stress. Stress models, or theories, aim to describe the specific mechanisms explaining the stress process. Some adopt a general, or nonspecific, mechanism of stress, whereby any number of job conditions can lead to stress symptoms, while others adopt a differentiated mechanism of stress, whereby specific job factors lead to specific consequences (see van Velhoven et al., 2005 for a review). For example, conservation of resources theory (Hobfoll, 1989) suggests a threat or loss of any resource is stressful versus the job demands-control model suggests that only in specific situations of high demands and low control lead to job strain (Karasek, 1979). Most contemporary stress theories use the general, or nonspecific, mechanism definition of stress in combination with a transactional model (Daniels & Guppy, 1994; Ganster & Perrewé, 2011). The transactional model is rooted in Lazarus' (1966) framework which suggests that stressors, or external environmental events or conditions, give rise to individual perceptions of stress, that in turn lead to psychological, affective, or behavioural strain outcomes (Folkman & Lazarus, 1990; Ganster, 2008; Lazarus, 1966). In other words, stress is relational between the individual and the environment (Lazarus, 1990). Strain is defined as elevated levels of burnout, psychosomatic health complaints, physical health symptoms, and mental health symptoms (de Jonge, Bosma, Peter, & Siegrist, 2000; Harnois & Gabriel, 2000).

Lazarus' framework requires an individual to perceive the stressor, thus requiring both a subjective stress appraisal and personal approach to coping (Lazarus, 1966;

Lazarus & Folkman, 1984). Therefore, in this conceptualization, stress does not reside solely in the individual or in the environment, but there is a transaction between the two (Lazarus, 1990). Contemporary transactional stress models use this framework by stating that different stressors have specific characteristics and each person has unique perceptions of those demands and their abilities or resources to cope with them (Beehr & Bhagat, 1985; McGrath, 1976). However, each theory differs in their descriptions and importance of specific stressors, the appraisals, and how individuals can cope or lessen the stressor's impact. Overall, Lazarus established the concept that there needs to be something external impacting the person (i.e., stressors) that give rise to an individual experience of the phenomena (i.e., stress), which, then, gives rise to negative outcomes (i.e., strain).

The person-environment fit model (Caplan, Cobb, French, Harrison, & Pinneau, 1975) states that stress occurs when the needs, motives, and preferences of the worker do not match the requirements of the job or the environment (Caplan et al., 1975; Edwards & Cooper, 1990; French, Caplan, & Harrison, 1982). Therefore, this model suggests that when a person appraises their work environment as not coinciding with their personal needs, stress occurs. The person-environment fit model aligns with Lazarus' model, in that, person variables, environmental variables, and stress outcomes (i.e., strain) all need to be examined to understand stress (French et al., 1982). However, this model supposes that specific linkages exist between the environment and the person. For example, skills and values, and demands and abilities need to fit or match (Edwards & Cooper, 1990). Unfortunately, this model had difficulties in application and contributed more to our

understanding of workplace stress theoretically rather than pragmatically (Edwards, Cable, Williamson, Schurer Lambert & Shipp, 2006; Edwards & Cooper, 1990).

The Karasek (1979) job demands-control model of stress model outlines theoretical and empirical support for the separation of job characteristics that cause harm versus those that help (Karasek, 1979; van der Doef & Maes, 1998). Specifically, job demands are defined as the psychological stressors involved with workload, time pressure, unexpected tasks, and job-related personal conflict (Karasek, 1979), whereas control is the power to have a say in one's tasks and conduct at work (Karasek, 1979). The model specifies that job demands need to be balanced by a personal sense of control in order to keep strain at bay—making it a differentiated mechanism stress theory (Karasek, 1979; Vehoeven, Maes, Kraaij, & Joeke, 2003). Therefore, job control is the only coping mechanism proposed for aversive job demands, or stressors. This theory builds on the previous models in that not only does the environment supply harmful stressors, but it can also provide positive buffers or resources to attenuate whether individuals feel stressed. The job-demands-control model only received modest support and, therefore, a social component was added to the framework making it the job demands-control-support model (Johnson & Hall, 1988; Karasek & Theorell, 1990). This social component was composed of social support, such that support helps provide individuals with a coping mechanism against increased demands (Johnston & Hall, 1988). More recently, this model's weaknesses have been exposed because strain is not typically measured directly but is assumed under conditions of high demands and low control (Karasek, 1979). Therefore, this model disregards individual differences or experiences (Kain & Jex, 2010). Additionally, the job demands-control-support model has

questionable mathematical calculations (e.g., difference scores; see Karasek, 1979) and it is sometimes seen as too simplistic (Verhoeven et al., 2003). For example, individuals with high demands and high control are typically more satisfied and individuals with low demands and low control are typically indifferent—a result that cannot be seen by using difference scores. Although Karasek proposed an interaction between demands and control, it was not tested as such. This led researchers to examine control as a buffer, or interaction, effect (van der Doef & Maes, 1998). This buffer approach, however, lacked an underlying theory, or causal mechanism, as to why only control and support would attenuate the negative impact of job demands (Elsass & Veiga, 1997). Consequently, although the job demands-control-support model brought important concepts such as demands, job control, and social support to the forefront of organizational stress literature, it did not provide an understanding as to why or how they impact strain outcomes. Modern theories, such as the job demands-resources model, have begun to build upon this model by incorporating job demands, control, and support into a framework that explains why individuals experience stress (Verhoeven et al., 2003).

A third stress theory found in the literature stems from medical sociology—the effort-reward model (Siegrist, 1996). The effort-reward imbalance model defines work stress as any discrepancy between an individual's work efforts and the rewards they receive (Siegrist, 1996; 2002). That is, stressors are defined as how much effort an employee is exerting, and rewards are the coping mechanism to buffer any negative effects on health and well-being. The model uses individuals' perception of their own efforts and rewards and, therefore, it also taps into an individual's need for control (Ostry, Kelly, Demers, Mustard, & Hertzman, 2003). This model builds upon the job demands-

control model by adding the concept that individuals have needs and are assessing their current status in conjunction with the environment. The effort-reward imbalance model is valuable because it incorporates individual differences with effort and reward assessment (Siegrist, 1996). Although the effort-reward imbalance model has received empirical support, it has also been criticized for being too specific, or narrowly focused, as well as requiring unconventional mathematical computations (see Ganster & Perrewé, 2011). However, the concept of imbalance lends itself to the contemporary ideas of unmet and unfulfilled needs.

A fourth theory of stress was developed by Hobfoll (1989) and was termed the conservation of resources model of stress. Conservation of resources states that people strive to retain, protect, and build resources, and when resources are threatened or depleted, stress is experienced (Hobfoll, 1989). Burnout, or strain, will occur when an individual perceives that a resource was lost and/or cannot be replenished (Westman, Hobfoll, Chen, Davidson, & Laski, 2005). Conservation of resources was the first model to specifically theorize stress as being dynamic (Westman et al., 2005). That is, it proposes that stress is not static and can vary on a day-to-day basis from changing perceptions of resources. Similar to Lazarus' (1966) model, the conservation of resources model provides the literature with the ideas that resources do not necessarily have to be depleted to experience stress, and that just the threat or insufficient resources can have adverse effects. Additionally, it also highlights the importance that stress is not a one-and-done phenomenon and it can persist or spiral, and reinforces the idea that to fully understand the stress phenomenon, stress needs to be examined dynamically rather than at one time-point.

Although the conservation of resources model has received a lot of support, it has been criticized as being used as a post-hoc explanation for stress researchers (see Ganster & Perrewé, 2011 for a review). That is, because of the lack of specificity around the definition of a resources, it allows for almost any construct to be able to be defined as a resource and, thus, has been applied to a vast variety of situations without theoretical justification (Ganster & Perrewé, 2011). This lack of specificity makes it very difficult to refute the theory—violating the scientific canon of testability or falsifiability. Therefore, although the conservation of resources model has found good support, specificity and theoretical justification are needed.

Each of these stress theories has contributed to our current understanding of stress phenomena. These theories are complementary, in that they contribute unique perspectives of stress but also build upon each other. For example, combining these theoretical models has been found to have greater prediction of strain outcomes (Calnan, Wainwright, & Almond, 2000; de Jonge et al., 2000; Peter, Siegrist, Hallqvist, Reuterwall, Theorell, & SHEEP Study Group, 2002; Ostry et al., 2003; Rydstedt et al., 2007). Unfortunately, issues with mathematical computation (e.g., person-environment fit, job demands-control-support, effort-reward imbalance), disregarding individual differences (e.g., job demands-control-support), being too simplistic or specific (e.g., job demands-control model, effort-reward imbalance) or being too vague (e.g., conservation of resources) led to no one theory being supported unequivocally. However, each model has its merits. The person-environment fit model provides the foundation that each individual will experience stress differently. The job demands-control-social model highlights the importance of control and social resources. The effort-reward imbalance

model discusses the idea of unmet and unfulfilled needs. And, finally, the conservation of resources introduces the idea of dynamism in stress theories. That is, the experiences of stress are constantly fluctuating as individuals adapt their use of resources and try to cope.

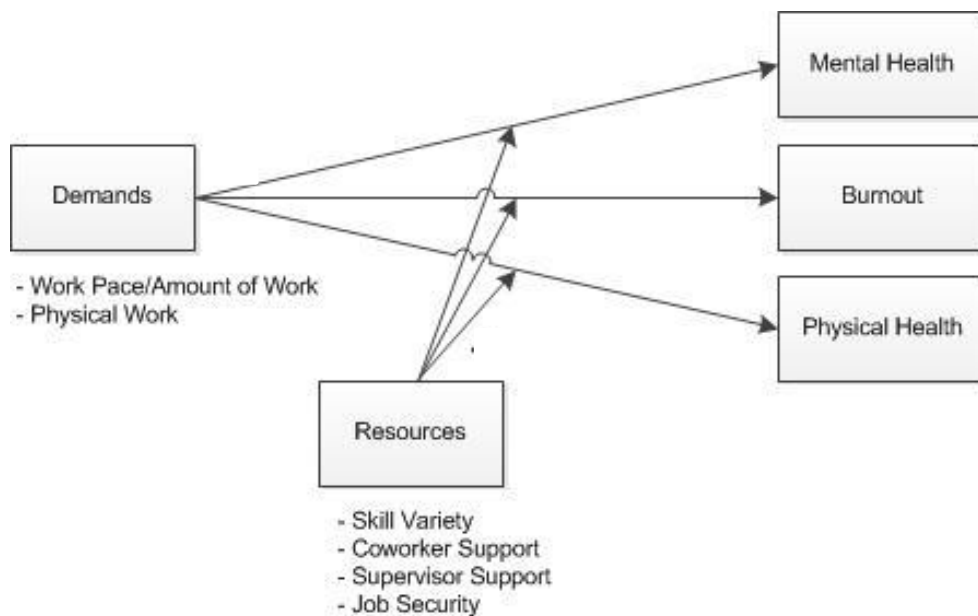
Job Demands-Resources Model

The evolution of these stress theories led to the development of the job demands-resources model (Demerouti et al., 2001)—arguably the most common model in the literature today (Searle & Lee, 2015). This model follows a similar structure as the job demands-control model, in that resources (including control) are the moderators of the job stressors (demands) which lead to stress and strain. However, the job demands-resources model differs from the job demands-control model as it uses a general mechanism approach rather than a differentiated mechanism (Verhoeven et al., 2003). Demands are defined as the job aspects that are required to sustain physical and/or psychological efforts that lead to strain (Bakker & Demerouti, 2017; Demerouti et al., 2001), while resources are defined as the job aspects that are either functional in achieving work goals, reduce job demands and the associated psychological/physiological costs, and/or stimulate personal growth, learning, and development (Bakker & Demerouti, 2007; Bakker & Demerouti, 2017; Bakker, Demerouti, & Euwema, 2005). Demerouti and colleagues (2001) proposed that the underlying mechanism of the job demands-resources model could be explained with two psychological processes: the health impairment process and a motivational process. The health impairment process suggests that chronic demands or poorly designed jobs exhaust an employee's resources and energy. The motivational process suggests resources act as a mechanism to increasing perceptions of

potential and engagement. This has created a debate on whether the job demands-resources model should have distinct paths from demands and resources to outcomes or whether resources interact, or moderate the relationship between demands and outcomes as hypothesized. For example, Bakker and colleagues (2005; 2010) and Xanthopoulou, Bakker, Dollard, Demerouti, Schaufeli, Taris, and Schreurs (2007) found support for moderation, while Boudrais, Desrunaux, Gaudreau, Nelson, Brunet, and Savoie (2011) did not. Inconsistent results led to the proposal that demands better predict job strain whereas resources better predict positive work outcomes such as engagement, commitment, and job motivation (Bakker & Demerouti, 2017; Bakker et al., 2010). That is, there is a direct relationship from job demands to strain outcomes, but there is not a direct relationship between resources and strain outcomes. Therefore, if a study is predicting positive work outcomes such as engagement, satisfaction, or commitment, a direct path would be hypothesized between resources and these positive work outcomes. However, when only strain is examined as an outcome, resources would not directly impact strain, but would still impact, or moderate, the relationship between demands and strain. Many studies have supported this moderation, or stress-buffering effect (e.g., Bakker et al., 2010; van den Tooren, de Jonge, Vlerick, Daniels, & Van de Ven, 2011). Recent research has shown that resources are a buffer, or moderator, between demands and strain outcomes (Bakker et al., 2005; Bakker et al., 2010; Xanthopoulou et al., 2007). That is, they can attenuate the effects that job demands have on various aspects of strain. For example, having more decision-making within your job can alleviate the negative impact of a heavy workload because you can choose when and how you take on your workload. Generally, supportive studies of the moderation relationship like Bakker, van

Veldhoven, and Xanthopoulou (2010) examined over 10,000 employees from almost 150 different organizations of various industries, whereas Boudrais and colleagues (2011) examined a few hundred teachers. These findings suggest that for a generalizable group of workers job resources moderate the relationship between job demands and strain, but within homogenous groups, such as teachers, there may be specific job demands that are not moderated by resources. Previous research (e.g., Kelloway & Barling, 1991) has supported that linear relationships between job characteristics and mental health provide more adequate representation in homogeneous populations. For this dissertation, because a wide variety of occupations will be sampled, the job demands-resources model will be tested as it is in Figure 1 with resources moderating the relationship between job demands and strain.

Figure 1. Moderated job demands-resources model



The job demands-resources model has been tested with different instruments, in different occupations, and even in different countries lending to its credibility and

generalizability (e.g., Llorens, Bakker, Schaufeli, & Salanova, 2006). Marchand and colleagues (Marchand, Demers, & Durand, 2005) found that the job demands-resources model accounted for nearly half of all the variation in psychological distress and the experience of strain. That is, the job demands-resources model alone can explain almost 50% of the variance of why individuals experience symptoms such as psychological distress or strain. In the more recent theoretical developments of the job demands-resources model two characteristics were proposed: (1) resources moderate the relationship between demands and strain and (2) certain demand levels need to match certain resource levels (Bakker et al., 2005; Bakker et al., 2010; Xanthopoulos et al., 2007). That is, high demands and low resources will produce the highest strain levels, whereas high demands and high resources will produce the highest levels of motivation (Bakker et al., 2010). Bakker and colleagues (2010) found that any specific job resources might interact with any specific job demands. Therefore, although this model helps outline “what stress is”, we still are missing a full explanation of “why” or “how” strain occurs as the result of stressors. Specifically, this model explains *why* high demands are damaging through the health impairment process and it explains *why* resources can be attributed to motivational and positive health outcomes. However, it does not explain *how* resources buffer demands. In other words, having two underlying processes does not explain the interaction that has been supported more recently in the literature. For example, why would burnout decrease when the amount of work you have is still high but your role allows you to pull from a variety of your skills? How are resources helping individuals re-evaluate their demands so they no longer impact our health? Although the characteristic of matching demands and resources has not received much support (e.g.,

van den Tooren et al., 2011), it does pay homage to previous stress models' ideas that there are needs to be met or resources to be utilized given high demands.

“Why do we experience stress?”: Basic Psychological Needs Satisfaction

One potential explanation as to why individuals experience stress in the workplace may be found from self-determination theory (Gagne & Deci, 2005; Talley, Kocum, Schlegel, Molix, & Bettencourt, 2012; Van der Broeck, Vansteenkiste, De Witte, & Lens, 2008). Self-determination theory is a macro-theory that was developed to combine psychoanalytic, humanistic, behavioural, cognitive, and post-modern psychological theories (Ryan & Deci, 2002). One specific facet of self-determination theory is basic psychological needs satisfaction (Roche & Haar, 2011; Ryan & Deci, 2002). Basic psychological needs satisfaction suggests that humans have three basic psychological needs that are universally important to help to develop and grow, to maintain integrity, and to be physically and psychologically healthy (Deci & Ryan, 2000). That is, all three needs are essential for everyone and their well-being. These three needs are the need for competence, the need for autonomy, and the need for relatedness. The need for competence is the desire to feel capable of mastering, manipulating, and feeling effective in their environment, to bring about desired outcomes, and to manage challenges (White, 1959; Vandersteenkiste, Neyrinck, Niemiec, Soenens, De Witte, & Van den Broeck, 2007). The need for autonomy is the desire to experience ownership and behaviour, to act with a sense of volition, and to endorse one's actions or beliefs (Deci & Ryan, 1987; Deci & Ryan, 2000; Deci, Ryan, Gagné, Leone, Usunov, Kornazheva, 2001). It is important to note that this definition is different from traditional concepts of autonomy in that it does not pertain to individualism, independence, or separateness (Deci & Ryan,

1987; Deci & Ryan, 2000; Deci et al., 2001). Finally, the need for relatedness is the desire for close and intimate relationships that are stable and enduring (Baumeister & Leary, 1995). Everyone has the capacity to fulfill these needs, however, situational contexts can influence these mechanisms, potentially making an individual feel unfulfilled in some or all of their needs (Ryan & Deci, 2000). Unlike previous needs theories like McClelland's theory of need-based motivation, which discusses specific need strength and preference, all three basic psychological needs are essential to be satisfied for healthy functioning (Boudrais et al., 2011; Deci & Ryan, 2000; Gagne & Deci, 2005; Van der Broeck et al., 2008; Van den Broeck, Vansteenkiste, De Witte, Soenens, & Lens, 2010). These three needs have been supported cross-culturally (e.g., Deci et al., 2001; Vansteenkiste, Lens, Soenens, & Luyckx, 2006) and in different life domains (Baard, Deci, & Ryan, 2004; Deci & Ryan, 2000; Sheldon, Ryan, & Reis, 1996); however, each culture and group may express and satisfy their basic psychological needs in different ways (Deci et al., 2001; Vansteenkiste et al., 2006).

A lack of basic psychological needs satisfaction may be the reason why individuals experience stress in the workplace (Reis, Sheldon, Gable, Roscoe, & Ryan, 2000; Sheldon et al., 1996; Van der Broeck et al., 2008). That is, in the context of the job demands-resources model, higher resources help satisfy basic psychological needs, reducing the impact of demands on strain. In other words, unmet basic psychological needs may mediate the relationship between job demands and strain. This would mean that it's not the job demands themselves that are stressful, but it's about our basic psychological needs that are not being satisfied. Therefore, unsatisfied needs would cause an individual to not feel self-determining, thereby, creating ill effects. Comparably,

when the job demands-resources model was initially developed, resources were conceptualized akin to basic psychological needs (Bakker et al., 2010). That is, job resources play either an intrinsic motivating role—fostering employees’ growth, learning, and development—and/or they play an extrinsic motivating role by being instrumental in achieving work goals (Bakker & Demerouti, 2007). Differentiating the objective resources (e.g., social support, autonomy supportive environment, job security) from the subjective, psychological need satisfaction is imperative. For example, having an autonomy supportive environment is not the equivalent to having your need for autonomy satisfied. An autonomy supportive environment would be a necessary but not sufficient condition for having your need for autonomy satisfied. An autonomy supportive environment changes the relationships between satisfaction of one’s need for autonomy and strain outcomes—implying a moderation relationship. Therefore, resources may moderate the relationship between job demands and basic psychological needs satisfaction. Basic psychological need satisfaction represents an individual’s psychological energetic, or internal, resource to stimulate well-being, whereas unmet needs leads to strain (Deci & Ryan, 2000). Generally, resources help individuals believe that problems can be solved, goals can be reached, and stressful situations can be positively tolerated, influenced, and/or controlled (Bandura, 1986). And as job resources promote growth and basic psychological needs satisfaction for individuals to thrive, it is likely that the relationship between job demands and job resources on strain can be explained by needs satisfaction (van den Broeck et al., 2008). That is, job demands and the absence of job resources will cause strain because basic psychological needs are not met (Ryan & Deci, 2000; van den Broeck et al., 2008).

When examining this phenomena, Van der Broeck and colleagues (2008) predicted basic psychological needs satisfaction would mediate the relationship between demands and burnout, job resources and burnout, and job resources and vigour with a Belgian working sample. Demands and resources were not composite variables, but rather consisted of subcomponents, while basic psychological needs satisfaction was a latent factor of all three needs. These variables predicted subcomponents of burnout and vigour scales. Model testing indicated that the satisfaction of the basic psychological needs acted as a partial mediator in the relationship between job demands and exhaustion and the relationship between job demands and vigour, whereas it fully accounted for the association between job resources and burnout. The researchers recommended that the relationship between job demands and burnout needs to be examined more closely. Specifically, because this research was only examined cross-sectionally, causal ordering could not be determined. Consequently, the authors recommended longitudinal and/or cross-lagged model testing between job demands, job resources, basic psychological need satisfaction, and job well-being. In examining longitudinal research of basic psychological needs satisfaction as a mediator, Reis and colleagues (2000) and Sheldon and colleagues (1996) found that the satisfaction of the need for competence and the need for autonomy lead to greater daily well-being at both a between- and a within-subjects level for student participants. Both studies examined daily well-being in the form of positive and negative affect, psychological vitality, and physical health symptoms for two weeks. Specifically, having the need for competence and autonomy met not only led to increased well-being among students, but also daily fluctuations of need satisfaction led to higher well-being compared to individual participants' baselines. These findings

suggest that it is important to understand these models both across individuals as well as within individuals over time.

These studies suggest that we are on the right path toward understanding workplace stress by incorporating basic psychological needs satisfaction and the job demands-resources model, but model conceptualization remains incomplete. Van der Broeck and colleagues (2008) found that basic psychological needs satisfaction mediated between the job demands-resources model and strain. However, they did not examine this relationship over time. Examining the relationship over time will help us better understand individual fluctuations and person-by-person differences. Additionally, mediation is better tested across multiple time sessions to add support that mediation is occurring rather than individual differences contributing to a single time-point (Maxwell, Cole, & Mitchell, 2011). Although Reis and colleagues (2000) and Sheldon and colleagues (1996) have examined basic psychological needs satisfaction with general life stressors over time, they did not examine these relationships with work stressors specifically. Examining workplace stress over time is also essential because stress is not always a single event. Stressors can be single events, constant stimuli, or fluctuating changes; therefore, it is important that a stress model reflects the varying types of stressors it is examining (Lazarus, 1990). Overall, we understand that demands cause employees to feel stress; yet two employees can be under equal demands, with one experiencing stress while the other is not. Therefore, not only is it important to examine the individual experience of stress but also the differences of stress experienced between individuals.

“Why am I experiencing stress but you aren’t?”: Individual Experiences of Stress

Although the combination of the job demands-resources model and basic psychological needs satisfaction proposes an enhanced understanding of the mechanism explaining why individuals experience stress in the workplace, it does not answer why some individuals experience stress and others do not under identical job demands. It also does not answer why employees have seemingly random “off days”. As Marchand and colleagues (2005) suggested, “individuals are not passive beings who are subjected to the social conditions in which they live since when they act, they bring with them constraints and resources peculiar to them and shaped by their bodies, minds, and social context” (p. 10). To add to our understanding of individual experiences of stress in the workplace, this dissertation aims to add two novel components: (1) utilizing resources is not a static, one-time process, but rather is dynamic in that individuals will utilize resources at different stages while evaluating stress, and (2) these relationships exist, and are important, not just for the individual but also across individuals.

First, individuals may show differences in their levels of strain because utilizing resources is not a static, linear solution. That is, workers will seek out job resources before basic psychological needs are unsatisfied, as well as after they have been depleted. Another way to think about this phenomenon is that resources may hold both an inoculation effect and a restorative effect. That is, resources inoculate, or prevent, basic psychological needs from being dissatisfied in the presence of demands. For example, when facing a heavy workload, employees may draw on resources such as setting their own schedule and prioritizing goals to enhance their self-efficacy to satisfy their need for

competence and autonomy (van den Broeck et al., 2008). Additionally, resources restore, or treat, the effect of demands even after they have depleted our basic psychological needs. For example, if an employee's need for competence is not met, they may seek social support from their supervisor or peers to receive feedback or assistance to help satisfy this need. This dynamic approach to stress is consistent with transaction models of stress which show the stress process as a continual transaction between external demands, resources, and internal needs—where an individual strives to maintain balance and not experience strain (Cox & MacKay, 1981; Daniels & Guppy, 1994). Additionally, this way of conceptualizing resources is similar to Lazarus' (1990) stress model in that there is a primary appraisal in the presence of a stressor to determine what is at stake, and then there is a secondary appraisal to determine what coping mechanism may be required. Therefore, the stress relationship is not static, but constantly changing due to the transactions between the individual and the environment (Lazarus, 1990).

The idea that stress is a dynamic process stems from Walter Cannon's work from the early 20th century (Cooper & Dewe, 2004; Friedman, 1990). Cannon stated that the body is constantly striving to maintain an environment that promotes the health of each individual cell (Friedman, 1990). This gave rise to the concept of homeostasis, or the body's ability to maintain its own consistency (Cooper & Dewe, 2004). Therefore, even though the body's goal is for a static state, there is a dynamic process of self-regulation and compensation to maintain stability (Cooper & Dewe, 2004). Applying Cannon's idea to this research, under stressful conditions, individuals will constantly strive to offset the demands with their resources to ensure their needs are still being satisfied. The seeking

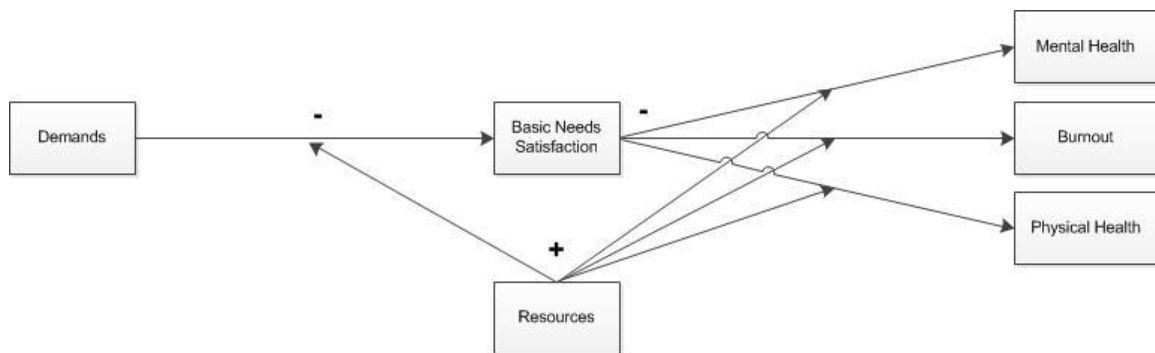
out of resources will be a continuous process that does not just occur at one time-point but over time.

A dynamic approach to stress is also consistent with the conservation of resources model of stress (Hobfoll, 1989). For example, those who do not have many resources are more susceptible to resource losses and these losses bring about future losses (Hobfoll & Lilly, 1993; Hobfoll & Shirom, 2000). Therefore, people are constantly attempting to reshape, reposition, or acquire resources to adjust to their ever-changing demands (Westman et al., 2005). A dynamic approach to stress is also consistent with the personal resources adaptation model (van den Heuvel, Demerouti, Bakker, & Schaufeli, 2010). The personal resources adaptation model assumes that with any organizational change, employees' resources will be implicated (van den Heuvel et al., 2010). That is, any change may negatively or positively impact job resources (van den Heuvel et al., 2010). In this model, with increased demands, people will adapt their behaviours, process new information, and/or utilize new resources. The personal resources adaptation model also proposes that resources are a moderator of the adverse impact of job demands (van den Heuvel et al., 2010). More resourceful employees will be more motivated and better able to spot resources in the changing environment and use them to their advantage—improving outcomes.

It is likely that seeking out resources does not occur at one specific time-point. An individual will seek resources to lessen the impact of objective job demands and to lessen the psychological impact the demands have. Consequently, it is hypothesized that resources not only moderate the relationship between demands and basic psychological needs satisfaction, but also the relationship between basic psychological needs

satisfaction and strain (see Figure 2). For example, the social support from a colleague or supervisor (i.e., a resource) may buffer the impact of repetitive work (i.e., a demand) to reduce the impact on one's basic psychological needs satisfaction. However, repetitive work may have already negatively impacted an employee's basic psychological needs satisfaction, and therefore, the employee may seek out social support or positive feedback (i.e., another resource) to help reduce the potential symptoms of strain.

Figure 2. Hypothesized mediation of the job demands-resources model and basic needs satisfaction



This “double moderation” is a novel approach to understand the job demands-resources model and basic psychological needs satisfaction, but it is not a novel analytic technique in psychology. For example, Murray and colleagues (Murray, Bellavia, Rose & Griffin, 2003) conducted a diary study examining how chronic perceptions of a partner's regard affected how people in intimate relationships interpret and respond to daily relationship stresses. That is, felt vulnerability mediated the relationship between the event and stress response, and perceived regard moderated both the paths before and after the mediation.

This proposed model is important to understanding differences between individuals, as well as within individuals' own experiences of stress and how demands, resources, and strain covary together over time. That is, it is not only important to understand how on the whole, higher demands and lower resources will lead to greater strain, but it is also important to understand how each individual's demands and resources covary with their strain outcomes. Few studies have compared the between-person and the within-person results simultaneously. When examining the job demands-resources model with daily levels of job satisfaction and mental health with teachers, Simbula (2010) found that 61% of exhaustion at work was explained from between-person variation. That is, over half of the differences in individuals' levels of exhaustion can be found from individual differences—highlighting the importance of not only understanding how fluctuations in stressors impact employees but also how their personal attributes affect how they experience stress. Researchers generally agree that individual differences play a moderating role in the effects of work stressors, or demands (Alarcon, Eschleman, & Bowling, 2009; Ganster, 2008; Swider & Zimmerman, 2010). However, the conceptualization of stress is defined in terms of individual fluctuations and many stress theories are tested as between-person analyses and only examine effects cross-sectionally (Hart & Cooper, 2002). When studies do examine stress over time, analyses typically remain at the between-person level (Simbula, 2010; Xanthopoulou, Bakker, Heuven, Demerouti, & Schaufeli, 2008). Given that job demands fluctuate on a day-to-day and week-to-week basis, a within-person analysis seems to be just as important as a between-person analysis (Butler, Grzywacz, Bass, & Linney, 2005; Simbula, 2010; van den Broeck, De Cuyper, Luyckx & De Witte, 2012). However, because few studies have

decomposed both the within- and between-person effects simultaneously, most results have not provided both perspectives concurrently.

A diary study will allow for assessment of the fluctuations of basic psychological need satisfaction and strain as well as allow for the control of individual differences and other potential confounds (Ryan & Deci, 2000). Researchers (e.g., Dormann & van de Ven, 2014; Van den Heuvel et al., 2010) recommended that resources be examined over time, suggesting that quantitative daily or weekly diary studies would help uncover these processes. Understanding these phenomena over time may also help explain why employees experience “off days” (Demerouti & Bakker, 2011)—capturing the effects of stressor fluctuations.

In summary, two levels of mediation and moderation are of interest: within-person (i.e., over time) and between-person (cross-sectional). Each model tests a different research question. The within-person model will assess whether job demands covary with weekly strain levels through fluctuations in one’s basic psychological needs satisfaction, and whether resources moderate the levels of strain experienced. That is, do people experience greater strain at times when demands are greater vis-à-vis lower basic psychological need satisfaction? And does this relationship covary given the amount of resources reported, with lower levels of resources associated with higher levels of strain? The between-person model answers a different question—do people who report greater demands also report experiencing more strain, vis-à-vis lower reported basic psychological needs satisfaction, given the levels of resources reported? Therefore, the longitudinal model asks about *when* and under *what* conditions these relationships hold, whereas the cross-sectional model asks *for whom* do these relationships hold. Assessing

both models, concurrently, provides a full picture of the estimated effects—a decomposition that has not been tested previously.

The strain outcomes for this study include burnout, physical health, and mental health symptoms. Both burnout and physical health can vary daily (Simbula, 2010). For example, Simbula found that daily fluctuations in school teachers' demands and resources predicted day-level physical health symptoms through burnout and job satisfaction. However, Simbula only examined the main effects of job demands and resources and advocated that interactions be examined in future studies. Simbula also suggested that additional work contexts and longer time periods be examined to enhance generalizability and determine whether these predictor variables have long-term consequences.

Additionally, in nonclinical populations, mental health symptoms have relatively low stability (Thomas, Bergström, & Rosqvist, 2013). That is, mental health symptoms are not constant traits in nonclinical population (Thomas et al. 2013). Therefore, there is reason to justify examining how fluctuations in job demands, resources, and basic psychological need satisfaction could potentially contribute to fluctuations in mental health symptoms for a working sample. Understanding the effects of demands, resources, and basic psychological need satisfaction on nonclinical mental health symptoms may be able to help us understand how long-term clinical mental health symptoms develop.

Given the survey length and our measures of strain, weekly diary studies will be undertaken. Weekly surveys are also chosen to assess the impact of stress fluctuations rather than change; therefore, long time intervals are not necessary. Weekly time periods have been used successfully with previous stress studies. For example, previous research

examined weekly reports of stress covaried with elevated immune activity in rheumatoid arthritis patients (Zautra, Hoffman, Matt, Yocum, Potter, Castro & Roth, 1998).

Model Summary & Hypotheses

Overall, this dissertation aims to combine the job demands-resources model and self-determination theory's basic psychological needs satisfaction to help better outline what stress is, why we experience it, and why individuals experience it differently. Through increasing support for the job demands-resources model (e.g., Bakker et al., 2005; Bakker et al., 2010; van den Tooren et al., 2011; Xanthopoulou et al., 2007) and basic psychological needs satisfaction (e.g., Reis et al., 2000; Sheldon et al., 1996; Van der Broeck et al., 2008), there is strong justification that unsatisfied basic psychological needs could be the underlying reason to why individuals experience stress. Specifically, it is not necessarily the demands that give rise to strain, but it's that one or all of the three basic psychological needs are not being met. Additionally, the job demands-resources model of stress has led to increased understanding of "what is stress", but it does not fully address (1) the dynamism of stress and (2) why some individuals experience strain and others do not when under identical demands. To address the first issue, the theoretical models of conservation of resources and personal resources adaptation will be incorporated by suggesting that resources play a more dynamic role in the strain relationship. Research (e.g., Bakker et al., 2010; van den Tooren et al., 2011) has found that resources exert a buffer, or moderating effect, between demands and strain. That is, even if one's work demands are high, with enough resources, strain can be diminished or avoided. Basic psychological needs satisfaction will be included as an explanation why resources buffer demands, or why individuals experience stress. Resources are

hypothesized to attenuate the negative relationship of demands on basic psychological needs satisfaction as well as the negative relationship basic psychological needs satisfaction has on strain outcomes (*Hypothesis 1*; see Figure 2). That is, having more resources will buffer (or lessen) the negative impact of job demands on basic psychological needs satisfaction (*Hypothesis 1a*), and if basic psychological needs are not satisfied, more resource utilization can help lessen the negative impact on the individual's physical and psychological strain outcomes (*Hypothesis 1b*). These relationships are expected to be present cross-sectionally (i.e., averaged across weeks per each individual) as well as over time (i.e., at each weekly period).

To address why individuals experience stress differently, the hypothesized model will be examined over multiple time-points to assess not only the differences between individuals but also the fluctuations that occur for each individual on a week-to-week basis. No study to date has examined all three aspects of basic psychological needs satisfaction as a mediator between job demands-resources and strain with a diverse workforce across multiple time-points. However, studies (e.g., Sheldon et al., 1996; Simbula, 2010) have shown that aspects of these relationships can be found both at between- and within-person levels. Therefore, in addition to the double-moderated mediation, this model will be examined with a weekly diary study. A diary study will add more information about why some individuals experience strain while others do not while facing the same job demands by examining both between- and within-person fluctuations. A within-person analysis will allow for an examination of how strain outcomes covary with individual's demands and resources, while a between-person analysis will allow for an examination of for whom the average effect holds. A concurrent test of both the

between- and within- levels allows for unbiased estimates of the variables by acknowledging the nonindependence from the higher-level (Mathieu & Chen, 2011). Therefore, the moderated mediation model found in Figure 2 is hypothesized to be significant both at a between- and a within-subjects level (*Hypothesis 2*). That is, having more resources will buffer (or lessen) the negative impact of job demands on basic psychological needs satisfaction (*Hypothesis 2a*) and if basic psychological needs are not satisfied, more resource utilization can help lessen the negative impact on the individual's physical and psychological strain outcomes (*Hypothesis 2b*). Support for Hypothesis 2a would suggest that an individual's specific resources could buffer the impact demands have on their satisfaction of basic psychological needs, relative to their current levels of demands and resources.

Method

A diary study was undertaken to assess job demands, resources, and basic psychological need satisfaction on strain across a variety of job roles on a week-to-week basis. The survey took on average 30 minutes for Week 1 and 21 minutes for subsequent weeks.

Procedure

Five time-points, or weekly surveys, were requested from participants at approximately one-week time intervals (see Appendix A for survey communications). Five time-points is advantageous to help buffer against attrition, increase power, and increase generalizability (Ohly, Sonnentag, Niessen & Zapf, 2010). Researchers (e.g., Hox & Maas, 2001; Muthén, 1989) have also recommended at least 50-100 people be sampled for multilevel structural equation modeling (MSEM). However, given that

moderators tend to require higher levels of power (McClelland & Judd, 1993), a power analysis recommended 300-400 participants be surveyed (see Appendix B for power analysis syntax). The survey was sent out on randomized days of the workweek to avoid any confounds associated with any particular day of the week (e.g., the weekend effect; Reis et al., 2000). As an incentive, customized reports of each participants' levels of stress and lack of need satisfaction were provided (see Appendix C).

Sample

This study used a broad working population found through personal business contacts and social networking. A total of 704 participants completed the initial survey and 338 participants completed at least 3 surveys to be included within the analysis. Three sub-samples make up the full sample population: a federal law enforcement agency, a publicly-traded industrial equipment distribution organization, and a social media sample which included participants from industries such as health care, education, and finance. Overall, 73.50% of participants worked for the government, 18.60% with a publicly traded organization, 5.9% with a privately-owned organization, 2.7% with a publicly-funded organization, and 0.3% were other. Organizations were predominately large with 76.30% of companies having over 10,000 people. Additionally, within each group, there was role-level variability ranging from those in entry-level positions (e.g., Mechanic, Child & Youth Worker) to executive-level (e.g., Chief Financial Officer, Business Development Executive). Therefore, the sample generally aligned with Hakanen and colleagues' recommendation to sample those in labour, technical, financial, professional, and service workforces for appropriate population generalizability (Hakanen, Schaufeli, & Ahola, 2008).

Participation consisted of 184 males and 152 females (one participant disclosed as other and one did not disclose). The mean age of participants was 43.92 years old, ranging from 21 to 68 (SD = 9.23). The sample was predominately Canadian (97.34%) and was representative of Canada in terms of its ethnic demographics as 88.20% were Caucasian, 3.60% were Aboriginal/First Nations, 1.80% were South Asian 0.60% were Middle Eastern, 0.30% were African-Descent, 0.30% were East Asian, and 5.4% were disclosed as either mixed or other (Canada is approximately 86.6% Caucasian and 13.4% Visible Minorities; Statistics Canada, 2006). When identifying their first language, 88.50% of participants spoke English, and most of the remaining participants spoke French (i.e., 10.2%; remaining languages were Punjabi, Miq'Maq, and Czech). Most participants (74.30%) were married or common-law, 14.50% were single, 6.20% were divorced, 3.80% were separated, and 0.90% were widowed (one participant did not disclose). Of all the participants, 59.5% had dependants. Of those with dependants, on average, participants had two dependants which were predominately children (94.52%). Most participants had an average, or middle-class, socioeconomic status (61.70%) with a mean personal income of \$100,029.83 CAD and a mean household income of \$144,187.05 CAD. Compared to the average working Canadian, this sample is approximately double the national average (i.e., personal income is \$46,057, Statistics Canada, 2016a; and the average household income is \$70,336, Statistics Canada, 2016b).

Participants' were typically characterized as being within their current role for 5.42 years and within their organization for 12.79 years. Approximately half of participants did not have direct reports (52.40%). Participants predominately worked full time (98.80%), working an average of 43.75 hours per week on a regular schedule

(75.70%)—not shift work. Hours worked were usually according to participants' schedule (67.26%), and of those who worked additional hours, it was generally not mandatory/required by their employer (75.22%).

Instruments

Demographics. Basic demographic questions were asked of participants as highlighted above. Demographic questions were roughly based on the Statistics Canada (2012) National Household Survey (Appendix D). Demographics were collected to ensure they did not significantly correlate with the constructs of interest. Demographics were asked only during the first survey to avoid survey fatigue. If, however, individuals stated that they changed jobs within the survey timeframe, they were re-asked about their job characteristics.

Demands and Resources. The job demands-resources model has been supported with multiple instruments (Llorens et al., 2006). Therefore, in this study, a parsimonious scale was used. Job demands and resources items were taken from the modified Questionnaire on the Experience and Evaluation of Work (i.e., the VBBA; Appendix E; Notelaers, De Witte, van Veldhoven, & Vermunt, 2007). This scale was originally modeled after the Job Content Questionnaire by Karasek and colleagues (i.e., Karasek, Brisson, Kawakami, Houtman, Bongers and Amick, 1998) and has been validated by Notelaers and colleagues (2007) and van Veldhoven and colleagues (van Veldhoven, de Jonge, Broersen, Kompier, & Meijman, 2002; van Veldhoven et al., 2005). Consistent with the theoretical definition of the job demands-resources model, individual facets of demands and resources were mapped onto composite scores of "Demands" and "Resources". Latent factors of demands and resources have been validated by

confirmatory factor analysis by several researchers (Demerouti et al., 2001; van der Broeck et al., 2008). The job demands scale contains items pertaining to pace of work (3 items), emotional workload (3 items), role conflict (3 items), and role ambiguity (3 items). The job demands scale had good internal consistency at each time-point (Cronbach's $\alpha = 0.83-0.88$). The resources scale includes items pertaining to skill variety (3 items), skill use (3 items), social support (3 items), participation (3 items), and autonomy (3 items). The job resources scale had good internal consistency at each time-point (Cronbach's $\alpha = 0.89-0.91$)¹. These scales are assessed based on frequency of "Always = 3", "Often = 2", "Sometimes = 1", or "Never = 0". Overall composite scales of Demands and Resources were aggregated by the mean.

Basic Psychological Needs Satisfaction. Basic psychological need satisfaction was assessed with the Basic Needs Satisfaction at Work Scale (BNS-W) developed by van den Broeck and colleagues (Appendix F; van den Broeck et al., 2010). Each of the 18 items were assessed on a five-point scale (Totally Disagree = -2, Totally Agree = 2). This scale was validated by van den Broeck and colleagues (2010) and each basic psychological need satisfaction subscale has previously shown good reliability (van den Broeck et al., 2010). Within this study, there was also good internal consistency for all

¹ Some researchers (e.g., De Jonge et al., 2000) have found that job resources were best represented as non-linear factors. That is, at a certain point too much of a job resource, like skill use or skill variety, can become a demand. Therefore, factor structure and linearity of resources were checked for both the subcomponents and overall scale of Resources. Skill variety and skill use did display some unique characteristics compared to participation, social support, and autonomy (e.g., lower but still acceptable factor loadings), however, this uniqueness was not attributed to linearity or the relationships with strain variables. These unique characteristics appears to be related to within-person fluctuations based on organization attributes. Therefore, skill use and skill variety were included within the composite Resources score as linear subcomponents.

three needs at each time-point (Cronbach's $\alpha = 0.89-0.92$). An overall composite scale was aggregated by the mean and factor analyzed to ensure a one-factor scale.

Burnout. The first facet of strain was assessed with Maslach's Burnout Inventory-General Survey (Appendix G; Maslach & Jackson, 1984; 1986). This survey is the most commonly used instrument to measure strain (Bakker et al., 2004). Burnout is assessed with 16 items assessing emotional exhaustion, depersonalization, and diminished personal accomplishment. Burnout is measured by how much each item was experienced at work on a scale of "Never = 0" to "Every Day = 6". Reliability and validity of this measure and its subscales have been shown to be adequate (Maslach & Jackson, 1984; 1986; Taris, Schreurs, & Schaufeli, 1999). Within this study, the internal consistency was good for each time-point (Cronbach's $\alpha = 0.92-0.94$). This scale was aggregated by the sum.

Physical Health. The second facet of strain of daily physical health symptoms was assessed with the Giessen Subjective Complaints List (Appendix H; Brähler, Hinz, & Scheer, 2008). This 8-item scale is on a 4-point Likert-type scale from "No, not at all = 0" to "Yes, very much = 3". Wolff, Brose, Lövdén, Tesch-Römer, Lindenberger, & Schmiedek (2012) validated this scale as a one-factor solution for within-person analyses. This scale was aggregated by the sum of how many symptoms were currently being experienced.

Mental Health. A third facet of strain, mental health was assessed with the Mental Health Inventory (MHI-5; Appendix I). The MHI-5 was derived from the Medical Outcomes Study 35-Item Health Survey (Ware & Sherbourne, 1992) and is a diagnostic scale DSM-IV Axis I conditions. The scale is made up of five items

representing mental health symptomology—anxiety, positive affect, depression, and behavioural/emotional control. This scale has been validated with multiple studies (e.g., Berwick, Murphy, Goldman, Ware, Barsky, & Weinstein, 1991; Rumpf, Meyer, Hapke, & John, 2001). The scale's reliability was good across each time-point (Cronbach's $\alpha = 0.85-0.89$). The five items are assessed on a six-point frequency scale from "All of the time = 5 to "None of the time = 0". This scale was aggregated by the sum.

Variables

The model's predictors were job demands, job resources, and basic psychological needs satisfaction. Job demands are hypothesized to be moderated by job resources with job resources attenuating the relationship between demands and strain. This moderated relationship of job demands was proposed to positively impact the outcome of strain; in that, higher demands would bring about higher levels of strain. The strain outcomes were measured by the scale composites of burnout, physical health symptoms, and mental health symptoms. Therefore, these facets of strain were examined as separate outcomes versus a latent factor of strain. The demands-resources and strain relationship was hypothesized to be fully mediated by basic psychological needs satisfaction. The relationship between basic psychological needs satisfaction and strain were also proposed to be moderated by job resources. Consequently, the independent variables are work demands, resources, and basic psychological need satisfaction, and the dependent variables are the strain outcomes.

Variables were tested with a two-level multilevel structural equation model (see Appendix J). Stressors were assessed at both the within- and the between-person level because stressors tend to vary day-to-day and by person-to-person. Talley and colleagues

(2012) found that the satisfaction of the need for competence mediated the relationship between need for autonomy and relatedness and depressive symptoms both at a within- and a between-person analysis for women. Therefore, there is reason to speculate that all three of the basic psychological needs should be assessed at the within- and the between-person levels for both genders. Finally, previous research (e.g., Simbula, 2010) has shown that there is significant variance in strain levels not only between-persons but also within-persons. Given that both between- and within-person levels have been found to account for significant variance levels (e.g., Reis et al., 2000; Simbula, 2010; Talley et al., 2012), all variables of interest, with the exception of demographics were assessed both simultaneously at the between- and within-person level for the proposed research.

Analytic Plan

First, multi-level statistical modeling assumptions were checked to ensure the validity of testing the data collected. Assumptions were checked at both the univariate and multivariate level. This includes examining that sufficient data is collected per participant, exploring any differences between participants who dropped-out versus those who did not, and evaluating which demographics should be used as controls.

Hypotheses were tested using a multilevel moderated mediation model utilizing the multilevel structural equation modeling (MSEM; Preacher, Zyphur, & Zhang, 2010; see Appendix J). Mplus (Version 7.4) was used to conduct the MSEM. MSEM combines multilevel modeling and structural equation modeling. The advantage of MSEM over separate MLM and SEM analysis is that MSEM allows for simultaneous testing of Level 1 and Level 2 components as well as a test of mediation (path) models in which a construct can be both a predictor and an outcome (Preacher et al., 2010). MSEM

also separates indirect and direct within- and between-person effects, allowing for investigations of measurement invariance at both the within- and the between-level (Preacher et al., 2010). In the present study, Level 1 specifies the links among the variables at a weekly level and produces the slope and intercept coefficients to identify fluctuations in the relationships among variables. Level 2 specifies the relationship between within-person coefficients and the between-person variables, identifying individual differences.

Specifically, a 1-1-1 MSEM model (Preacher et al., 2010) was tested. This model places the predictor, mediator, and outcome all at one-level within a two-level hierarchy. The five weeks were assessed at Level 1 nested within-persons at Level 2. Weekly variables were centered around each person's mean. Centering the independent variables in this way breaks responses at a weekly level into two components—the average person's levels and the fluctuations on each week from the average level. This removes all the between-cluster variation from the predictor variable (Enders & Tofighi, 2007). The dependent variable reflects changes in each week from each person's average level. Level 1 variables were person mean-centered. As a result, centering the data allows one to understand whether between-person differences in mean levels moderated responses at a weekly level (Enders & Tofighi, 2007).

To ensure correct model identification, model building was utilized to ensure that there is sufficient between-cluster variability, the within-model is supported, and then the within- and between-models are supported simultaneously. This style of model building is common within research and recommended by researchers (e.g., Edwards & Lambert, 2007; Preacher et al., 2010). Model building allows researchers to pinpoint the paths of a

mediated model that are moderated, clarifies the form of each moderating effect with tests of simple slopes, provides estimates of indirect effects transmitted through the mediator at various levels across the moderator, and shows how the indirect and direct effects of the moderator are combined to understand the total effect captured by the model (Edwards & Lambert, 2007).

First, a null model of fixed effects was tested to act as a comparator model. That is, no predictors are inputted, only strain outcomes are examined to calculate a percent variance accounted for by our predictors. The null model estimates the within- and between-group variance on intercepts and provides an overall grand mean and its variability. Then, within-person effects (Level 1 slopes and intercepts) were tested to ensure effects varied significantly for individuals. The next stage of the analysis required assessing whether the within-person effects (Level 1 slopes and intercepts) vary significantly across individuals. That is, this analysis examined whether individual's demands, resources, and basic psychological need satisfaction varied week-to-week. If there is significant variation in the slopes between the independent variables (e.g., demands, resources, and basic psychological needs satisfaction) from the previous week and with dependent variables (strain outcomes) in the current week this would indicate that such slopes differ between-people. This finding would allow for the next step which involves searching for variables at the person-level that might moderate Level 1 effects. Any significant coefficients were, therefore, interpreted in terms of the effects of a person high or low on a given day relative to their own mean for that variable across each week.

The double moderation involved assessing the interaction (i.e., examining slopes, intercepts, and interaction) for significance estimates between a predictor and the

moderator as separate variables and then assessing the interaction between the two. The mediator is then added separately and, subsequently, with the interaction with the moderator. Next, both moderations are tested simultaneously to determine if both interactions remain significant in conjunction with one another. Testing moderation in the way allows for the examination of the simple, or main effects, of each predictor without moderation as well as with the moderation effect. This model building also allows for a better understanding of whether resources do play a static versus dynamic role in stress experiences by examining resources before and after the mediation paths.

The following within-person coefficients, or paths, were examined: (1) the direct effect of demands on basic psychological needs satisfaction; (2) the direct effect of resources on basic psychological needs satisfaction; (3) the direct effect of resource-moderated demands on basic psychological needs satisfaction; (4) the direct effect of resources-moderated demands on strain; (5) the direct effect of resources-moderated basic psychological needs satisfaction on strain; (6) the indirect effect of demands on strain through basic psychological needs satisfaction; (7) the indirect mediation effect of resources-moderated demands on strain through basic psychological needs satisfaction, and; (8) the indirect mediation effect of resource-moderated demands on strain through basic psychological needs satisfaction. The intraclass correlation coefficient was examined to ensure there was significant variance at both the between- and within-levels to justify both levels.

To assess between-person effects, Level 1 predictors (demands, resources, basic psychological needs satisfaction, and strain outcomes) were added. This allows individual-level strain outcomes to be examined from the individual-level independent

variables. Then, control variables (i.e., related demographics) were added to the model. The same eight coefficients, or paths, from the within-person analyses were examined at the between-level.

Results

Preliminary Analyses

Before testing the proposed model, preliminary checks were conducted. First, data was screened cross-sectionally. If participants did not complete the weekly survey within 10 days of their previous survey and at least 5 days since their last survey, their data was excluded from the analysis². This excluded 47 participants. 352 participants did not complete at least three surveys of the five within the study, and therefore were eliminated³. This resulted in usable data from 338 participants. Independent-samples *t*-tests were conducted on participants who completed two or fewer surveys compared to those who completed three or more. Participants who dropped out differed on age, whether they worked shift work, and on their first time-point for burnout (see Table 1). That is, those who were younger, worked shift work, and/or indicated higher burnout on the first survey were more likely to drop out.

A missing values analysis was conducted and no variables or demographics had more than 10% missing data at the first time-point. Missing data in Mplus was handled with multiple imputation using Bayesian analysis (Enders & Mansolf, 2018; Muthén & Muthén, 2017). Next, data was cleaned cross-sectionally. This included checking for

² This exclusion criteria is akin to previous research (e.g., Griep, Vantiborgh, Ballien, & Pepermans, 2016; Newcomb, 2013)

³ 50% of survey data as an exclusion point has been used in previous research (e.g., Griep et al., 2016; Totterdell, Wood, & Wall, 2006)

Table 1.

Means, standard deviations, and t-test results comparing usable data and drop-outs

Variable	Usable Participants (<i>N</i> = 338)		Drop Outs (<i>N</i> = 352)		<i>t</i>	<i>p</i>	<i>CI</i> (95%)
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Age	43.45	9.27	39.21	10.31	5.67	< .001	2.77 - 5.70
Shift Work	0.24	0.43	0.33	0.47	2.44	.02	.15 - .02
Burnout (Time 1)	41.85	17.94	44.95	17.02	2.20	.03	5.87 - .33

Note. Shift Work was coded 0 = No, 1 = Yes

outliers, normality, linearity, homoscedasticity, and multicollinearity. Ten univariate outliers were found. Inclusion of these outliers increased R^2 by 0.03 and, therefore, were winsorized to be within a ± 3.29 *z*-score. Probability plots, histograms, and box-plots were examined and no other assumptions were violated. Assumptions were then checked at a multivariate hierarchical level to ensure the model is estimable and the effects were unbiased (Bauer, Preacher, & Gil, 2006). No assumptions were violated and no multivariate outliers were found.

Table 2 shows the descriptive statistics for each time-point. Personal and work-related demographic questions were also assessed to determine if they correlated to any predictors, mediators, moderators, or outcomes. The following demographics had significant relationships to either the predictors or outcomes: gender, shift work, socioeconomic status, and work-home interference. Table 3 outlines the significant relationships between these demographics and the variables. Therefore, these particular demographics were also used as control variables within the main analyses. Reliability analyses using Cronbach's alpha were conducted on all scales at each time-point. Table 4

Table 2.

Descriptive statistics across each time-point

Variable	Week 1 (n = 338)		Week 2 (n = 287)		Week 3 (n = 271)		Week 4 (n = 237)		Week 5 (n = 237)	
	M	SD	M	SD	M	SD	M	SD	M	SD
Job Demands	1.34	0.41	1.24	0.48	1.20	0.51	1.15	0.50	1.14	0.51
Job Resources	1.69	0.56	1.67	0.60	1.61	0.59	1.63	0.58	1.62	0.57
Basic Needs Satisfaction	0.42	0.60	0.36	0.59	0.36	0.61	0.39	0.63	0.32	0.61
Burnout	41.31	17.91	42.11	18.10	42.28	19.08	41.71	19.91	42.35	19.15
Physical Health	3.53	2.06	3.02	2.07	2.91	2.22	2.67	2.26	2.79	2.30
Mental Health	9.14	5.06	8.18	5.79	8.23	5.45	8.30	5.51	8.41	5.26

Table 3.

Intercorrelations among demographics and composite within-person variables

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Gender	-									
2. Shift Work	-.22***	-								
3. Socioeconomic Status	-.15**	-.01	-							
4. Work-Home Interference	.03	.02	-.12*	-						
5. Job Demands	-.14**	.19***	-.06	.10	-					
6. Job Resources	-.00	-.12*	.19**	-.08	-.52***	-				
7. Basic Needs Satisfaction	-.09	-.03	.23***	-.06	-.56***	.72***	-			
8. Burnout	-.02	.13*	-.18**	.12*	.64***	-.69***	-.79***	-		
9. Physical Health	.19**	.08	-.21***	.11*	.48***	-.43***	-.43***	.58***	-	
10. Mental Health	.03	.05	-.18**	.08	.57***	-.57***	-.67***	.76***	.62***	-

Note. Gender was coded 0 = Female, 1 = Male. Dependents was coded 0 = No, 1 = Yes. Shift Work was coded 0 = No, 1 = Yes.
 * $p < .05$, ** $p < .01$, *** $p < .001$

outlines the reliability estimates with zero-order correlations between the variables. The five time-points of each variables were inter-related: demands ($r = 0.63 - 0.71$), resources ($r = 0.79 - 0.83$), basic psychological needs satisfaction ($r = 0.89 - 0.92$), burnout ($r = 0.83 - 0.90$), physical health ($r = 0.63 - 0.72$), and mental health ($r = 0.65 - 0.81$).

Table 4.
Intercorrelations and reliability estimates among the study variables

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
Week 1																				
1. Job Demands	(.83)																			
2. Job Resources	-.46*	(.89)																		
3. Basic Needs Satisfaction	-.50*	.66*	(.89)																	
4. Burnout	.60*	-.64*	-.75*	(.92)																
5. Physical Health	.39*	-.37*	-.36*	.51*	(-)															
6. Mental Health	.51*	-.55*	-.64*	.76*	.52*	(.86)														
Week 2																				
7. Job Demands	.71*	-.41*	-.49*	.52*	.40*	.45*	(.86)													
8. Job Resources	-.40*	.83*	.62*	-.61*	-.38*	-.50*	-.41*	(.91)												
9. Basic Needs Satisfaction	-.45*	.60*	.84*	-.68*	-.40*	-.60*	-.52*	.65*	(.90)											
10. Burnout	.57*	-.57*	-.71*	.90*	.53*	.73*	.61*	-.63*	-.74*	(.93)										
11. Physical Health	.34*	-.39*	-.36*	.44*	.72*	.49*	.41*	-.36*	-.36*	.48*	(-)									
12. Mental Health	.44*	-.49*	-.58*	.60*	.49*	.81*	.51*	-.49*	-.62*	.70*	.53*	(.85)								
Week 3																				
13. Job Demands	.67*	-.36*	-.37*	.47*	.35*	.42*	.75*	-.41*	-.43*	.54*	.36*	.44*	(.88)							
14. Job Resources	-.45*	.82*	.61*	-.59*	-.36*	-.53*	-.45*	.86*	.63*	-.62*	-.39*	-.51*	-.46*	(.91)						
15. Basic Needs Satisfaction	-.43*	.62*	.82*	-.69*	-.35*	-.59*	-.47*	.62*	.84*	-.70*	-.34*	-.58*	-.49*	.70*	(.91)					
16. Burnout	.54*	-.57*	-.67*	.85*	.50*	.68*	.57*	-.59*	-.69*	.88*	.46*	.61*	-.64*	-.76*	(.93)					
17. Physical Health	.38*	-.40*	-.39*	.49*	.66*	.54*	.43*	-.41*	-.44*	.52*	.69*	.57*	.41*	-.41*	-.41*	.57*	(-)			
18. Mental Health	.41*	-.46*	-.49*	.59*	.43*	.72*	.43*	-.46*	-.54*	.65*	.45*	.83*	.48*	-.52*	-.62*	.71*	.60*	(.88)		
Week 4																				
19. Job Demands	.63*	-.43*	-.50*	.50*	.40*	.47*	.71*	-.39*	-.49*	.54*	.38*	.44*	.77*	-.46*	-.51*	.59*	.45*	.48*	(.88)	
20. Job Resources	-.46*	.79*	.63*	-.63*	-.37*	-.54*	-.49*	.84*	.63*	-.65*	-.45*	-.55*	-.46*	.88*	.65*	-.66*	-.44*	-.57*	-.52*	(.91)
21. Basic Needs Satisfaction	-.48*	.60*	.82*	-.69*	-.44*	-.64*	-.53*	.58*	.83*	-.72*	-.47*	-.66*	-.46*	.66*	.87*	-.76*	-.52*	-.65*	-.56*	.69*
22. Burnout	.55*	-.59*	-.69*	.86*	.55*	.73*	.58*	-.57*	-.68*	.88*	.56*	.66*	.56*	-.66*	-.74*	.90*	.60*	.68*	.65*	-.69*
23. Physical Health	.38*	-.35*	-.40*	.44*	.63*	.52*	.38*	-.32*	-.42*	.48*	.69*	.48*	.44*	-.42*	-.41*	.55*	.77*	.53*	.46*	-.38*
24. Mental Health	.41*	-.43*	-.52*	.60*	.52*	.74*	.41*	-.40*	-.57*	.66*	.51*	.79*	.47*	-.52*	-.61*	.66*	.60*	.81*	.56*	-.53*
Week 5																				
25. Job Demands	.67*	-.38*	-.43*	.49*	.36*	.47*	.69*	-.38*	-.50*	.55*	.30*	.50*	.78*	-.44*	-.44*	.55*	.39*	.44*	.84*	-.48*
26. Job Resources	-.42*	.82*	.61*	-.62*	-.35*	-.52*	-.45*	.83*	.61*	-.60*	-.37*	-.52*	-.40*	.86*	.63*	-.61*	-.38*	-.46*	-.44*	.88*
27. Basic Needs Satisfaction	-.38*	.54*	.78*	-.67*	-.31*	-.54*	-.48*	.56*	.78*	-.67*	-.30*	-.56*	-.37*	.60*	.86*	-.67*	-.33*	-.52*	-.50*	.64*
28. Burnout	.52*	-.49*	-.61*	.83*	.51*	.65*	.55*	-.53*	-.63*	.85*	.48*	.62*	.53*	-.57*	-.67*	.87*	.57*	.61*	.58*	-.60*
29. Physical Health	.39*	-.29*	-.27*	.41*	.63*	.47*	.41*	-.35*	-.34*	.48*	.68*	.50*	.42*	-.37*	-.32*	.50*	.77*	.52*	.45*	-.34*
30. Mental Health	.43*	-.39*	-.46*	.55*	.45*	.65*	.45*	-.39*	-.48*	.63*	.41*	.75*	.47*	-.44*	-.52*	.62*	.51*	.76*	.53*	-.48*

Table 4 cont.
Intercorrelations and reliabilities among the study variables

Variable	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
Week 4										
21. Basic Needs Satisfaction	(.92)									
22. Burnout	-.78*	(.94)								
23. Physical Health	-.42*	.56*	(-)							
24. Mental Health	-.62*	.72*	.58*	(.89)						
Week 5										
25. Job Demands	-.55*	.62*	.42*	.51*	(.88)					
26. Job Resources	.66*	-.65*	-.29*	-.45*	-.48*	(.90)				
27. Basic Needs Satisfaction	.88*	-.77*	-.34*	-.57*	-.53*	.67*	(.91)			
28. Burnout	-.73*	.93*	.52*	.66*	.62*	-.64*	-.76*	(.93)		
29. Physical Health	-.40*	.52*	.77*	.53*	.38*	-.37*	-.33*	.56*	(-)	
30. Mental Health	-.59*	.67*	.49*	.85*	.56*	-.47*	-.63*	.73*	.52*	(.88)

Note. * $p < .001$.

ANOVAs were used to compare means for the three samples (i.e., the federal law enforcement agency, the publicly-traded industrial equipment distribution organization, and the social media sample) for all quantitative variables. The groups significantly differed on all variables. Table 5 shows the descriptive statistics and ANOVA results of the measured variables by study group. Although this research aimed to show generalizability of the hypothesized model, the law enforcement group may be experiencing such different types of demands or stress as well as having pre-existing conditions (e.g., post-traumatic stress disorder) that this model may be unlikely to evaluate experiences of stress similarly across diverse workforces. As Table 5 shows, strain outcomes for the law enforcement group are much greater than the other two groups. Therefore, these groups' results would be separated in further analyses. The social media group was significantly different than the other groups on both between- and within-level demands. When combined with the industrial group, the impact on R^2 was mixed (i.e., increased some outcomes and decreased others), therefore it was deemed inappropriate to combine them with another group. Finally, because of its low sample size ($N = 33$ and 133 total observations), the social media group was not included as its own group in the full analyses. Implications, limitations and future research of these differences are examined within the discussion. Table 6 and 7 show the means, standard deviations, and intercorrelations of the industrial group and the law enforcement group, respectively.

Table 5.

Means, standard deviations, and ANOVA results among the demographics by group

Variable	Industrial Group (<i>N</i> = 65)		Law Enforcement Group (<i>N</i> = 238)		Social Media Group (<i>N</i> = 33)		<i>F</i>	<i>p</i>
	M	SD	M	SD	M	SD		
Demands	1.25	.43	1.26	0.43	1.05	0.39	3.57	.03
Resources	1.86	.52	1.55	0.52	2.01	0.47	18.38	<.001
Basic Needs Satisfaction	0.63	.51	0.28	0.55	0.66	0.50	16.43	<.001
Burnout	33.39	16.00	44.99	17.06	32.76	16.23	17.38	<.001
Physical Health	2.27	1.74	3.29	1.90	2.57	1.38	9.16	<.001
Mental Health	6.93	4.71	9.02	4.88	7.68	4.11	5.43	.005

Table 6.
Means, standard deviations, and intercorrelations among the study variables for the industrial group

Variable	M	SD	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
Week 1																	
1. Job Demands	1.32	0.44															
2. Job Resources	1.89	0.56	-.52***														
3. Basic Needs Satisfaction	0.66	0.57	-.54***	.53***													
4. Burnout	32.38	16.63	.68***	-.67***	-.78***												
5. Physical Health	2.75	2.04	.33**	-.52***	-.43***	.59***											
6. Mental Health	7.64	4.91	.61***	-.65***	-.60***	.76***	.73***										
Week 2																	
7. Job Demands	1.25	0.58	.72***	-.53***	-.56***	.63***	.40**	.63***									
8. Job Resources	1.92	0.58	-.39**	.75***	.59***	-.60***	-.58***	-.62***	-.57***								
9. Basic Needs Satisfaction	0.63	0.57	-.43**	.43*	.79***	-.67***	-.44**	-.50***	-.65***	.65***							
10. Burnout	33.81	17.80	.58***	-.55***	-.76***	.84***	.60***	.71***	.75***	-.71***	-.80***						
11. Physical Health	2.23	2.06	.34*	-.53***	-.36**	.47***	.73***	.68***	.51***	-.54***	-.37**	.54***					
12. Mental Health	6.56	5.76	.62***	-.55***	-.56***	.63***	.64***	.83***	.74***	-.59***	-.61***	.72***	.68***				
Week 3																	
13. Job Demands	1.24	0.52	.65***	-.61***	-.47**	.51**	.42**	.59***	.84***	-.60***	-.57***	.67***	.60***	.70**			
14. Job Resources	1.81	0.65	-.58***	.75***	.46**	-.53***	-.44**	-.57***	-.77***	.80***	.44*	-.68***	-.69***	-.62***	-.73***		
15. Basic Needs Satisfaction	0.59	0.56	-.44**	.63***	.64***	-.69***	-.40*	-.39*	-.64***	.54**	.65***	-.71***	-.55**	-.50**	-.51***	.63***	
16. Burnout	35.46	18.96	.65***	-.60***	-.68***	.78***	.51**	.60***	.76***	-.59**	-.70***	.83***	.56**	.65***	.76***	-.69***	-.77***
17. Physical Health	2.33	2.24	.57***	-.51**	-.45**	.46**	.55***	.63***	.67***	-.43*	-.57**	.57**	.73***	.79***	.72***	-.55***	-.49**
18. Mental Health	6.52	6.07	.57***	-.57***	-.35*	.51**	.46**	.67***	.65***	-.48**	-.42*	.53**	.65***	.88***	.75***	-.57***	-.56***
Week 4																	
19. Job Demands	1.14	0.54	.45**	-.52***	-.62***	.55***	.39*	.57***	.73***	-.57***	-.72***	.73***	.70***	.76***	.83***	-.71***	-.71***
20. Job Resources	1.85	0.67	-.49**	.70***	.52**	-.54***	-.38*	-.59***	-.64***	.86***	.50**	-.62***	-.66***	-.57***	-.74***	.93***	.65**
21. Basic Needs Satisfaction	0.70	0.65	-.43**	.50**	.74***	-.66***	-.44**	-.52**	-.70***	.46**	.71***	-.72***	-.60***	-.62***	-.63**	.57**	.88***
22. Burnout	32.15	20.02	.54***	-.57***	-.70***	.79***	.53***	.70***	.72***	-.57***	-.67***	.86***	.74***	.74***	.73***	-.76***	-.82***
23. Physical Health	1.80	2.16	.28	-.36*	-.39*	.31	.39*	.52**	.44**	-.48**	-.47**	.48**	.74***	.67***	.63**	-.56**	-.37
24. Mental Health	6.71	5.20	.45**	-.57***	-.60***	.61***	.56**	.73***	.67***	-.55**	-.69***	.70***	.74***	.83***	.70***	-.59**	-.64**
Week 5																	
25. Job Demands	1.20	0.51	.71***	-.51***	-.55***	.56***	.45**	.57***	.76***	-.53**	-.60***	.61***	.63***	.72***	.84***	-.67***	-.62***
26. Job Resources	1.78	0.58	-.55***	.76***	.36*	-.59***	-.47**	-.55***	-.71***	.79***	.44**	-.62***	-.61***	-.61***	-.69***	.90***	.58**
27. Basic Needs Satisfaction	0.57	0.60	-.56***	.55***	.67***	-.68***	-.31*	-.45**	-.72***	.62***	.74***	-.66***	-.43**	-.61***	-.50**	.64***	.84
28. Burnout	34.70	17.26	.54***	-.60***	-.50***	.71***	.50***	.59***	.75***	-.54***	-.59***	.75***	.60***	.69***	.64***	-.73***	-.80
29. Physical Health	1.96	2.20	.46**	-.38*	-.24	.30*	.36*	.36*	.61***	-.48**	-.42*	.46**	.64***	.58***	.58**	-.46*	-.42*
30. Mental Health	7.02	5.28	.68***	-.61***	-.44**	.65***	.44**	.61***	.81***	-.56**	-.54**	.63***	.66***	.83***	.65***	-.64***	-.58**

Table 6 cont.

Means, standard deviations, and intercorrelations among the study variables for the industrial group

Variable	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
Week 3															
17. Physical Health	.71***														
18. Mental Health	.70***	.76***													
Week 4															
19. Job Demands	.80***	.81***	.74***												
20. Job Resources	-.71***	-.65**	-.64**	-.66***											
21. Basic Needs Satisfaction	-.81***	-.64**	-.59**	-.74***	.61***										
22. Burnout	.91***	.69***	.68***	.81***	-.75***	-.82***									
23. Physical Health	.57**	.85***	.68***	.68***	-.49**	-.44**	.61***								
24. Mental Health	.71***	.79***	.83***	.84***	-.58***	-.72***	.78***	.76***							
Week 5															
25. Job Demands	.77***	.83***	.81***	.87***	-.69***	-.71***	.72***	.65***	.79***						
26. Job Resources	-.70***	-.66***	-.69***	-.57**	.91***	.56**	-.67***	-.37	-.57**	-.60***					
27. Basic Needs Satisfaction	-.68***	-.50**	-.52**	-.61**	.74***	.88***	-.81***	-.35	-.64***	-.66***	.65***				
28. Burnout	.85***	.64***	.64***	.67***	-.74***	-.75***	.89***	.52**	.75***	.69***	-.73***	-.79***			
29. Physical Health	.53**	.79***	.63***	.68***	-.43*	-.46*	.52**	.80***	.72***	.55***	-.49**	-.38**	.55***		
30. Mental Health	.71***	.74***	.83***	.72***	-.65***	-.63***	.74***	.58**	.86***	.76***	-.67***	-.70***	.83***	.56***	

Note. * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 7.
Means, standard deviations, and intercorrelations among the study variables for the law enforcement group

Variable	M	SD	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
Week 1																	
1. Job Demands	1.38	0.46															
2. Job Resources	1.59	0.54	-.43***														
3. Basic Needs Satisfaction	0.31	0.58	-.48***	.64***													
4. Burnout	45.11	17.16	.59***	-.58***	-.71***												
5. Physical Health	3.77	2.05	.42***	-.29***	-.30***	.45***											
6. Mental Health	9.75	5.08	.51***	-.49***	-.63***	.76***	.48***										
Week 2																	
7. Job Demands	1.25	0.46	.71***	-.37***	-.49***	.52***	.42***	.41***									
8. Job Resources	1.54	0.56	-.38***	.84***	.57***	-.55***	-.30***	-.46***	-.36***								
9. Basic Needs Satisfaction	0.26	0.57	-.44***	.60**	.83***	-.65***	-.35***	-.63***	-.51***	.62***							
10. Burnout	45.28	17.20	.57***	-.51***	-.67***	.91***	.48***	.74***	.58***	-.56***	-.71***						
11. Physical Health	3.28	2.05	.38***	-.31***	-.32***	.40***	.71***	.44***	.43***	-.28***	-.32***	.44***					
12. Mental Health	8.72	5.90	.42***	-.44***	-.57***	.60***	.44***	.80***	.47***	-.44***	-.61***	.70***	.49***				
Week 3																	
13. Job Demands	1.22	0.51	.66***	-.31***	-.37***	.47***	.36***	.42***	.76***	-.36***	-.44***	.55***	.37***	.42***			
14. Job Resources	1.52	0.56	-.43***	.82***	.60***	-.55***	-.30***	-.48***	-.39***	.85***	.63***	-.56***	-.30***	-.47***	-.44***		
15. Basic Needs Satisfaction	0.28	0.61	-.43***	.58***	.84***	-.67***	-.30***	-.60***	-.48***	.61***	.85***	-.68***	-.29***	-.59***	-.51***	.69***	
16. Burnout	45.02	18.61	.52***	-.51***	-.64***	.85***	.46***	.69***	.56***	-.55***	-.67***	.88***	.43***	.60***	.60***	-.60***	-.75***
17. Physical Health	3.15	2.23	.34***	-.31***	-.31***	.45***	.69***	.49***	.39***	-.36***	-.37***	.48***	.70***	.51***	.51***	-.32***	-.34***
18. Mental Health	8.72	5.44	.38***	-.41***	-.49***	.60***	.42***	.74***	.39***	-.44***	-.54***	.69***	.43***	.82***	.82***	-.48***	-.60***
Week 4																	
19. Job Demands	1.17	0.50	.67***	-.39***	-.48***	.50***	.42***	.44***	.73***	-.35***	-.47***	.53***	.35***	.38***	.81***	-.41***	-.49***
20. Job Resources	1.53	0.55	-.42***	.80***	.63***	-.61***	-.35***	-.51***	-.45***	.84***	.62***	-.62***	-.38***	-.53***	-.44***	.86***	.62***
21. Basic Needs Satisfaction	0.27	0.60	-.46***	.57**	.82***	-.66***	-.43***	-.68***	-.53***	.57***	.83***	-.70***	-.42***	-.68***	-.46***	.66***	.85***
22. Burnout	45.13	19.10	.55***	-.53***	-.67***	.86***	.56***	.73***	.59***	-.53***	-.66***	.88***	.51***	.65***	.58***	-.60***	-.70***
23. Physical Health	2.90	2.28	.42***	-.30***	-.38***	.44***	.68***	.51***	.41***	-.27***	-.41***	.47***	.69***	.44***	.44***	-.34***	-.38***
24. Mental Health	8.68	5.46	.43***	-.38***	-.52***	.60***	.52***	.76***	.40***	-.37***	-.56***	.66***	.47***	.81***	.49***	-.47***	-.59***
Week 5																	
25. Job Demands	1.15	0.51	.65***	-.34***	-.42***	.51***	.38***	.46***	.68***	-.35***	-.53***	.60***	.31***	.48***	.76***	-.41***	-.43***
26. Job Resources	1.54	0.55	-.39***	.82***	.65***	-.60***	-.28***	-.50***	-.38***	.83***	.66***	-.58***	-.31***	-.51***	-.33***	.85***	.63***
27. Basic Needs Satisfaction	0.22	0.60	-.33***	.49***	.79***	-.62***	-.30***	-.55***	-.43***	.51***	.78***	-.65***	-.27***	-.55***	-.35***	.56***	.86***
28. Burnout	45.65	19.02	.53***	-.40***	-.60***	.83***	.50***	.65***	.55***	-.45***	-.62***	.86***	.47***	.61***	.54***	-.50***	-.63***
29. Physical Health	3.10	2.33	.39***	-.21**	-.21**	.37***	.69***	.46***	.38***	-.25**	-.28**	.44***	.71***	.47***	.42***	-.29***	-.27***
30. Mental Health	8.93	5.33	.37***	-.30***	-.44**	.51***	.46***	.65***	.36***	-.32***	-.47**	.63***	.39***	.75***	.44***	-.36***	-.50***

Table 7 cont.

Means, standard deviations, and intercorrelations among the study variables for the law enforcement group

Variable	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
Week 3															
17. Physical Health	.51***														
18. Mental Health	.72***	.66***													
Week 4															
19. Job Demands	.58***	.40***	.46***												
20. Job Resources	-.64***	-.39***	-.53***	-.47***											
21. Basic Needs Satisfaction	-.751***	-.48***	-.65***	-.52***	.67***										
22. Burnout	.91***	.57***	.67***	.63***	-.64***	-.75***									
23. Physical Health	.51***	.76***	.47***	.43***	-.33***	-.38***	.53***								
24. Mental Health	.64***	.57***	.81***	.51***	-.51***	-.63***	.69***	.55***							
Week 5															
25. Job Demands	.55***	.31***	.40***	.82***	-.43***	-.53***	.64***	.41***	.47***						
26. Job Resources	-.56***	-.28**	-.41***	-.41***	.86***	.67**	-.62***	-.24**	-.38***	-.45***					
27. Basic Needs Satisfaction	-.63***	-.24**	-.51***	-.48***	.57***	.86***	-.73***	-.30**	-.53***	-.52***	.65***				
28. Burnout	.87***	.52***	.61***	.59***	-.52***	-.70***	.93***	.50***	.62***	.65***	-.59***	-.73***			
29. Physical Health	.45***	.75***	.49***	.45***	-.28**	-.35***	.49***	.77***	.49***	.38***	-.30***	-.27***	.52***		
30. Mental Health	.59***	.46***	.74***	.51***	-.40***	-.58***	.65***	.47**	.85***	.53***	-.39***	-.60***	.72***	.51***	

Note. * $p < .05$, ** $p < .01$, *** $p < .001$.

Analyses

Based on significant differences in the variables of interest found in the preliminary analyses, the industrial group and the law enforcement group were examined as separate groups. The industrial group ($N = 65$) and the law enforcement group ($N = 238$) had 230 and 965 observations, respectively.

Industrial Group. First, a null model of fixed effects was tested to represent baseline estimates. The intraclass correlations (ICC) ranged from 0.57 to 0.79 (see Table 8), indicating that 57-79% of the explained variance in strain outcomes was accounted for by between-subjects portion of the model, and between 21-43% was accounted for at the within-subjects level 1. This suggests that when there was substantial variance worthy of investigation at both levels of the model over the five-week period. Then, control demographics were included to determine a R^2 to compare the models against. The between-person R^2 for each strain outcome ranged from 0.43-0.50, which were all significant at the $p < .001$ level and the within-person R^2 ranged from 0.04-0.07 and were not significant (see Table 8). Each independent variable, mediator, and interaction term was added progressively to ensure R^2 increased at each step. R^2 increased at each step for the majority of the time. Both between- and within-person effects (Level 1 slopes and intercepts) were tested separately to ensure effects varied significantly across and for individuals, respectively. Significant within-level paths between the outcomes, mediator and independent variables were found, suggesting employees' demands, resources, and basic psychological needs satisfaction varied significantly from week-to-week. This variation supports the nested structure of the data and continuing a multi-level approach as well as searching for variables at the level of the person that might moderate Level 1

Table 8.

Variance explained through model building for the industrial group

	Basic Needs							
	Satisfaction		Burnout		Physical Health		Mental Health	
	ICC	R^2	ICC	R^2	ICC	R^2	ICC	R^2
Null Model	-	-	0.79	-	0.57	-	0.73	-
Controls Only	-	-	0.81	-	0.57	-	0.74	-
Between-Person	-	-	-	0.43***	-	0.47***	-	0.50***
Within-Person	-	-	-	0.04	-	0.04	-	0.07
Between-Person Only	-	0.56***	0.81	0.86***	0.56	0.87***	0.73	0.81***
Within-Person Only	-	0.23**	-	0.08**	-	0.09*	-	0.01**
Full Model without Controls	-	-	0.83	-	0.59	-	0.75	-
Between-Person	-	0.55***	-	0.84***	-	0.85***	-	0.77***
Within-Person	-	0.19***	-	0.40***	-	0.12**	-	0.29**
Full Model with Controls	-	-	0.84	-	0.59	-	0.75	-
Between-Person	-	0.56***	-	0.83***	-	0.90***	-	0.83***
Within-Person	-	0.23**	-	0.38***	-	0.14*	-	0.32***

Note. * $p < .05$, ** $p < .01$, *** $p < .001$.

effects. At the within-level the $R^2\Delta$ for each strain outcome increased significantly when combining both the within- and between- models.

Hypothesis 1. Resources were hypothesized to attenuate the negative relationship of demands on basic psychological needs satisfaction as well as the negative relationship between basic psychological needs satisfaction on strain outcomes. The full hypothesized model was first examined without any demographic controls. That is, the within- and between-effects models were combined without the correlated demographic variables. Comparing the within-person results with the within-persons only model and the between-persons results with the between-persons only model, over half of the R^2 estimates decreased, while all still remaining significant. The R^2 decreases further justified why demographic controls were necessary to be included within the model. The

full model with controls had ICCs still suggesting a majority of strain outcome variance was coming from the between-level variation. Controls were then added into the model. In comparing this model to the model without controls, the majority of $R^2\Delta$ significantly increased and remained significant at the $p < .001$ level. Between-person R^2 for each strain outcome remained significant at the $p < .001$ level. Within-person R^2 was significant in the full model for all strain outcomes. Two strain outcomes' R^2 decreased from the no controls model: within-person physical health symptoms and between-person burnout. This could suggest suppression within the model, given the high inter-correlations between the variables.

To test both moderations within the moderated-mediation model, eight groupings of between-person paths were examined (see Table 9 and Figure 3). The first path examined the direct effect of demands on basic psychological needs satisfaction. This path was not significant, $\beta = -0.19, p = .331$. The second path examined the direct effect of resources-moderated demands on basic psychological needs satisfaction. This path was significant, $\beta = -0.26, p = .033, 95\% \text{ CI } [-0.50, -0.02]$ (see Figure 4⁴). The simple slopes of both low and high resources on basic psychological needs satisfaction were not significant, $t(50) = 0.07, p = .528$, and $t(50) = -0.80, p = .213$, respectively. This effect suggests that resources change the relationship of demands on basic psychological needs satisfaction. In that, individuals who have lower overall resources, across all levels of demands, have lower basic psychological needs satisfaction in comparison to those who have higher overall resources. The third grouping examined the direct effects of basic

⁴ All interaction plots are plotted at low = -1 standard deviation, average = mean, and high = +1 standard deviation.

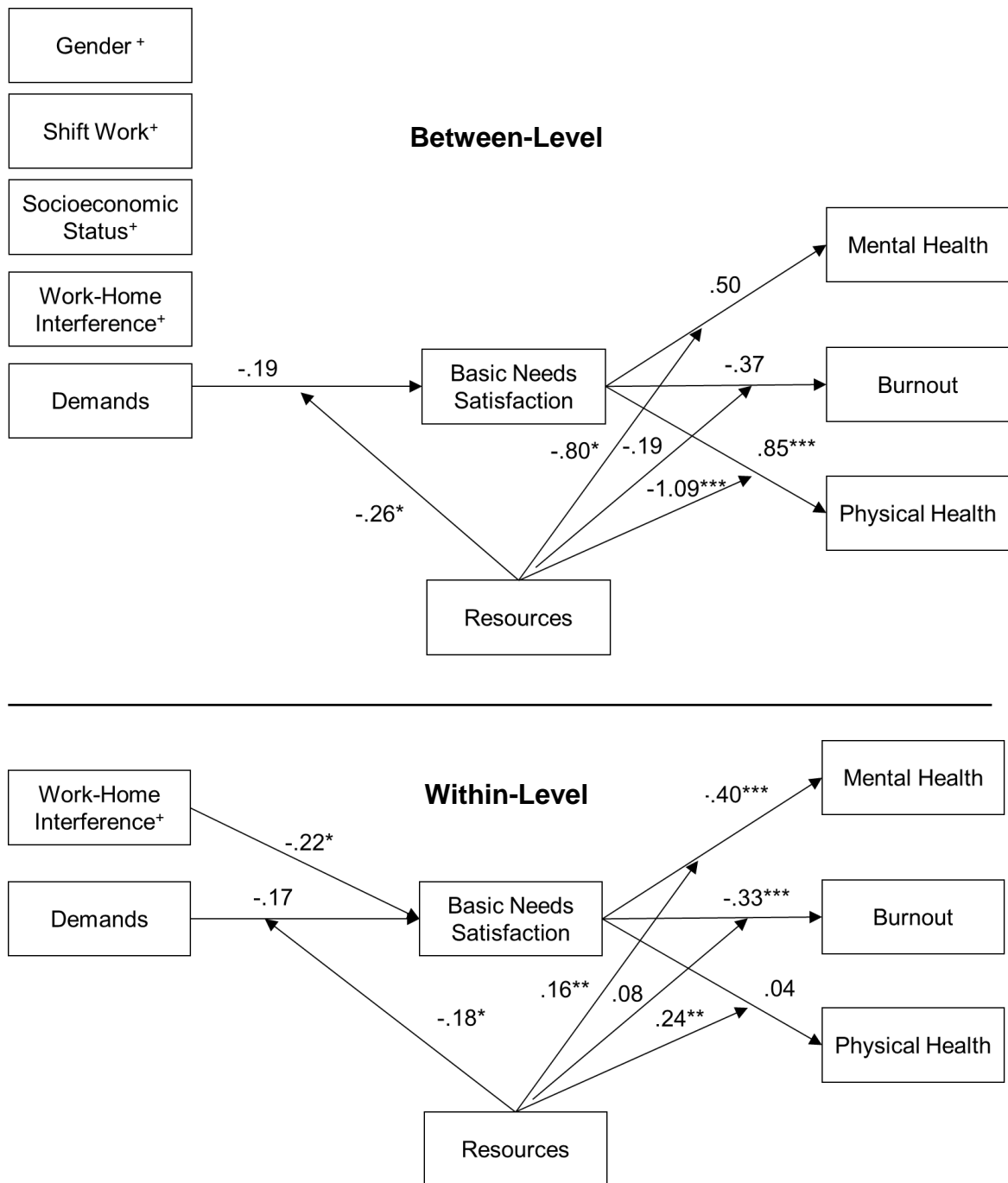
Table 9.

Full Model Estimates of the Strain Outcomes for the Industrial Group

Variables	Means	Variances	Basic Needs Satisfaction		Burnout		Physical Health		Mental Health	
			β	SE	β	SE	β	SE	β	SE
Between-Person										
Gender	1.27	0.20	-0.08	0.10	-0.03	0.06	0.13	0.08	0.02	0.08
Shift Work	1.22	0.17	-0.04	0.10	0.03	0.07	-0.02	0.07	-0.03	0.07
Socioeconomic Status	2.48	0.28	0.08	0.10	-0.07	0.06	-0.06	0.06	-0.03	0.06
Work-Life Interference	1.24	0.26	0.03	0.15	-0.03	0.10	0.12	0.10	0.17	0.09
Demands	1.25	0.19	-0.19	0.19	0.26	0.31	0.90***	0.19	1.06***	0.16
Resources	1.86	0.27	0.58**	0.19	-0.22	0.39	0.72**	0.21	0.67*	0.29
Basic Needs Satisfaction	0.63	0.26	-	-	-0.37	0.41	0.85***	0.18	0.50	0.31
Demands \times Resources	2.16	0.43	-0.26*	0.12	0.01	0.23	-0.57**	0.13	-0.54**	0.19
Basic Needs Satisfaction \times Resources	1.35	1.40	-	-	-0.19	0.55	-1.09***	0.18	-0.80	0.31
Within-Person										
Work-Home Interference	-0.00	0.13	-0.22*	0.09	-0.03	0.05	0.20*	0.08	0.08	0.06
Demands	-0.01	0.06	-0.17	0.11	0.30***	0.06	0.09	0.08	0.24***	0.05
Resources	0.00	0.06	0.25*	0.11	-0.26***	0.07	-0.01	0.07	-0.01	0.06
Basic Needs Satisfaction	0.00	0.07	-	-	-0.33***	0.08	0.04	0.09	-0.40***	0.06
Demands \times Resources	-0.01	0.01	-0.18*	0.07	-0.10	0.06	-0.12	0.11	-0.10	0.05
Basic Needs Satisfaction \times Resources	0.02	0.01	-	-	0.08	0.07	0.24**	0.09	0.16**	0.06

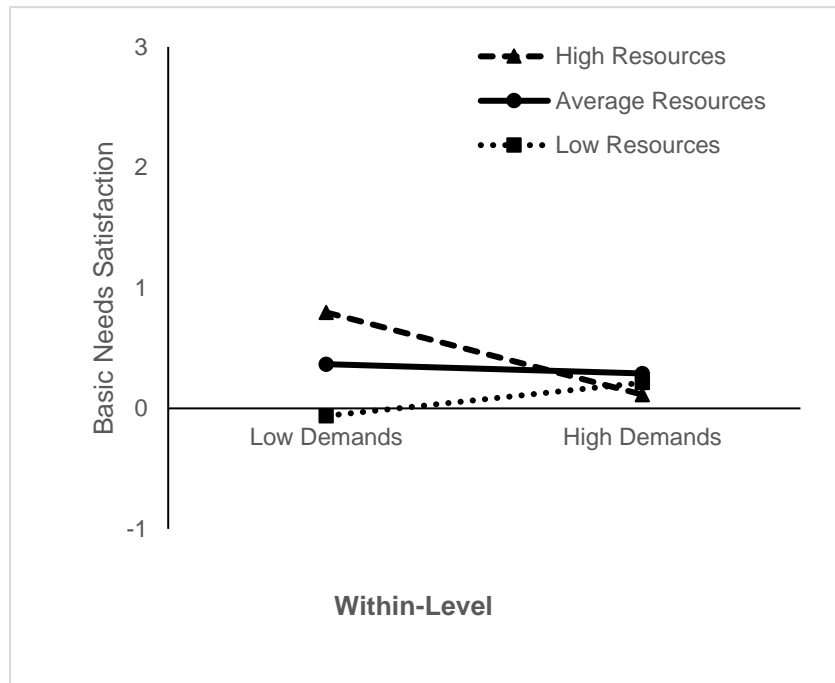
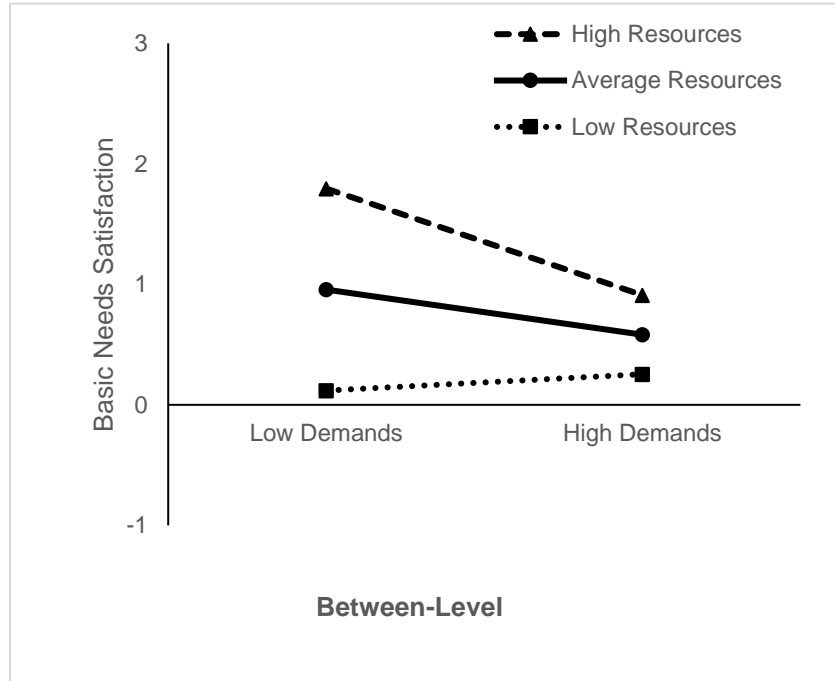
Note. * $p < .05$, ** $p < .01$, *** $p < .001$. Gender: 1 = Male, 2 = Female; Shift: 1 = No, 2 = Yes

Figure 3. Standardized path coefficients for the industrial group



Note. * $p < .05$, ** $p < .01$, *** $p < .001$. Gender: 1 = Male, 2 = Female; Shift: 1 = No, 2 = Yes. ⁺ Only significant paths are shown for controls. All path coefficients are for the final step model. Indirect within-level paths from resources-moderated demands through basic psychological needs satisfaction to burnout and mental health were significant, $B = 5.19^{**}$ and $B = 2.32^*$, respectively. No other indirect effects were significant.

Figure 4. Interactions of resources-moderated job demands on basic psychological needs satisfaction for the industrial group



psychological needs satisfaction on strain. Paths were significant from basic psychological needs satisfaction to physical health, $\beta = 0.85$, $p < .001$, 95% CI [0.50, 1.19], but not for burnout, $\beta = -.37$, $p = .368$, nor physical health, $\beta = 0.50$, $p = .104$. Therefore, there was not a significant direct effect from demands to basic psychological needs satisfaction to strain. The fourth grouping of paths examined the direct effects of resources-moderated demands on strain. Paths were significant from basic psychological needs satisfaction to physical health, $\beta = -0.57$, $p < .001$, 95% CI [-0.83, -0.31] (see Figure 5), and mental health, $\beta = -0.54$, $p = .004$, 95% CI [-0.90, -0.17] (see Figure 6), but not to burnout, $\beta = 0.01$, $p = .980$. These paths suggest that resources change the relationship of demands on strain outcomes. Specifically, individuals who have higher overall resources, across all levels of demands had greater physical and mental health symptoms in comparison to those who have lower overall resources. This is contrary to the proposed hypotheses. The simple slopes of low and high resources on physical health were not significant, $t(50) = 1.51$, $p = .931$, and $t(50) = 0.60$, $p = .724$, respectively. The simple slopes of low and high resources on mental health were not significant, $t(50) = 1.65$, $p = .948$, and $t(60) = 0.95$, $p = .826$, respectively. Additionally, the direct effects of resources-moderated demands to basic psychological needs satisfaction to strain, supporting partial mediation. Therefore, there is mediated moderation. The fifth grouping of paths examined the direct effects of resources-moderated basic psychological needs satisfaction on strain. Paths were significant to physical health, $\beta = -1.09$, $p < .001$, 95% CI [-1.44, -0.75] and mental health, $\beta = -0.80$, $p = 0.018$, 95% CI [-1.45, -0.14] (see Figure 7 and 8), but not for burnout, $\beta = -0.19$, $p = .732$. The simple slopes of low and high resources on physical health were not significant, $t(50) = 1.69$, $p = .952$, and $t(50) =$

Figure 5. Interaction of resources-moderated job demands on physical health for the industrial group

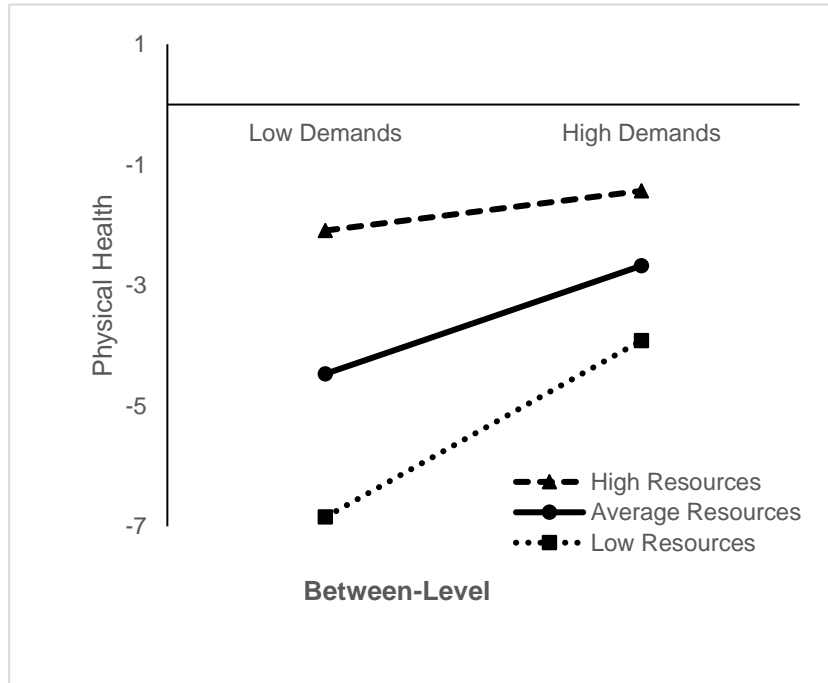


Figure 6. Interaction of resources-moderated job demands on mental health for the industrial group

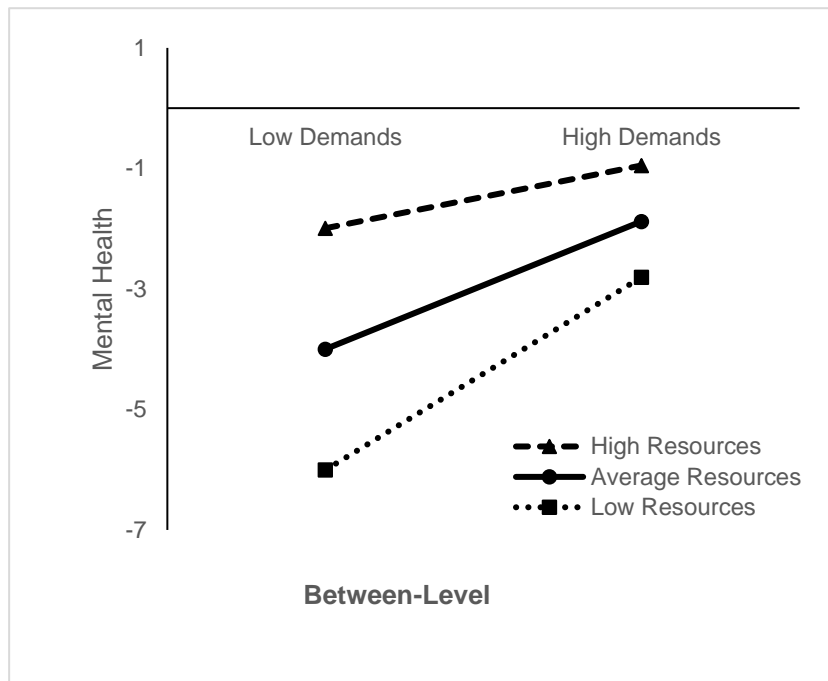


Figure 7. Interaction of resources-moderated basic psychological needs satisfaction on physical health for the industrial group

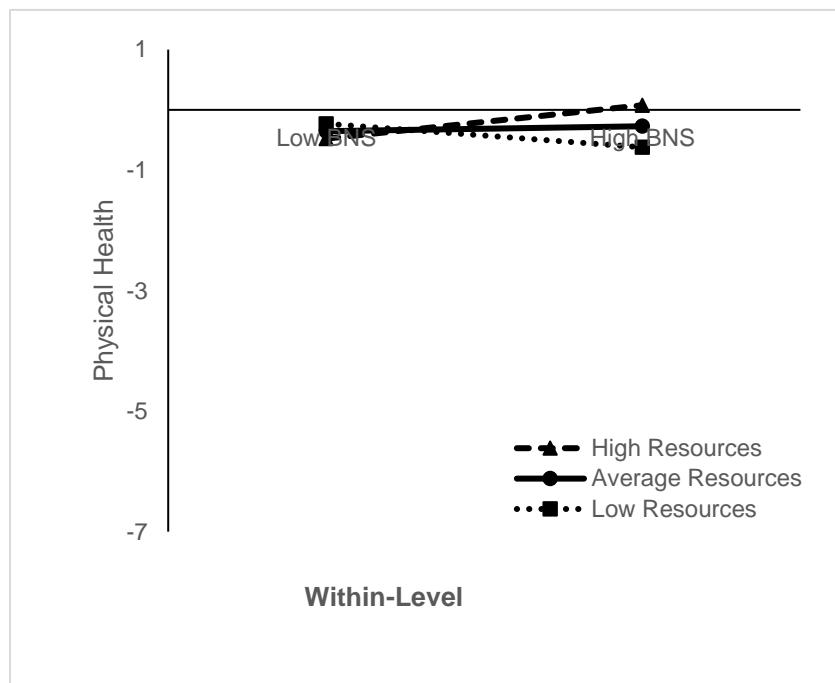
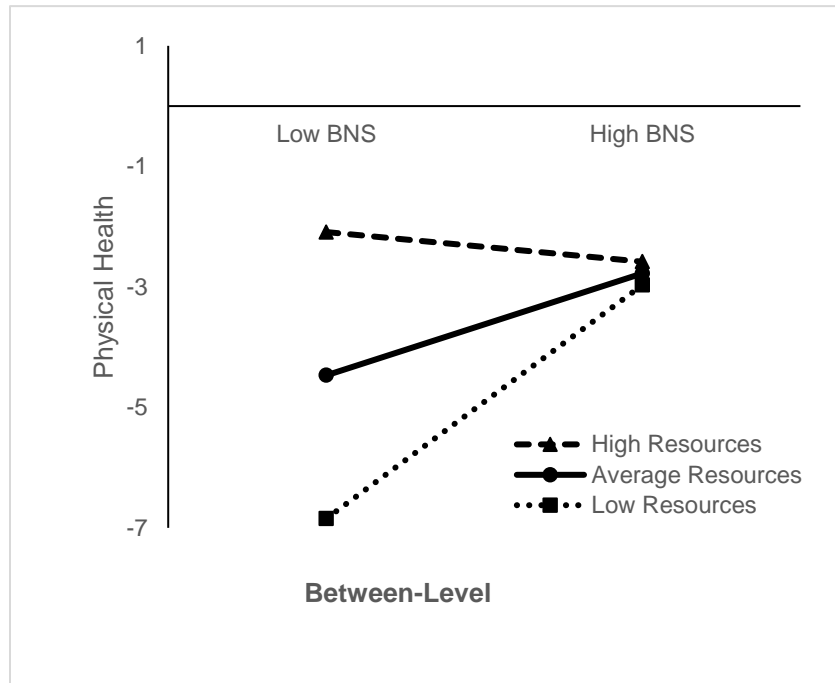
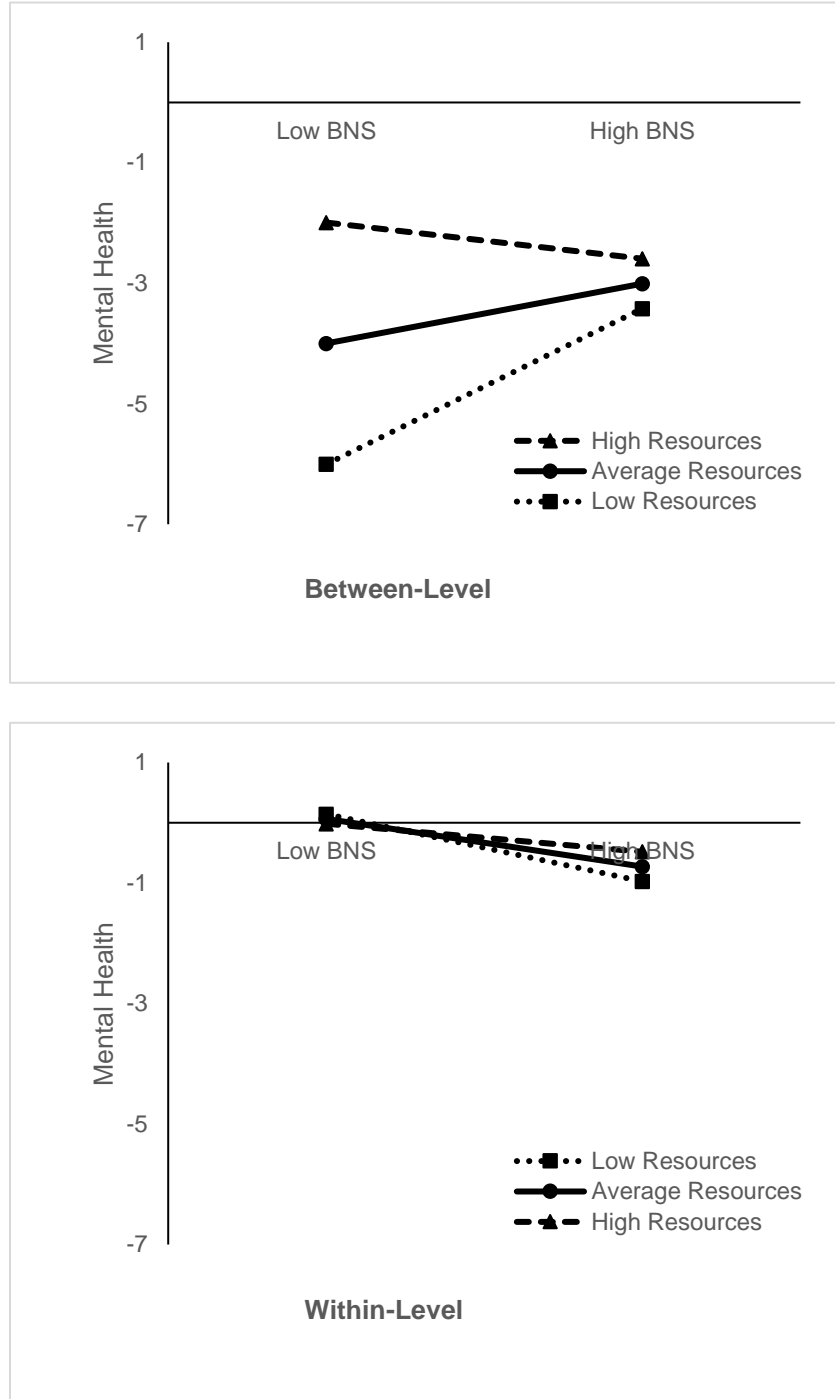


Figure 8. Interaction of resources-moderated basic psychological needs satisfaction on mental health for the industrial group

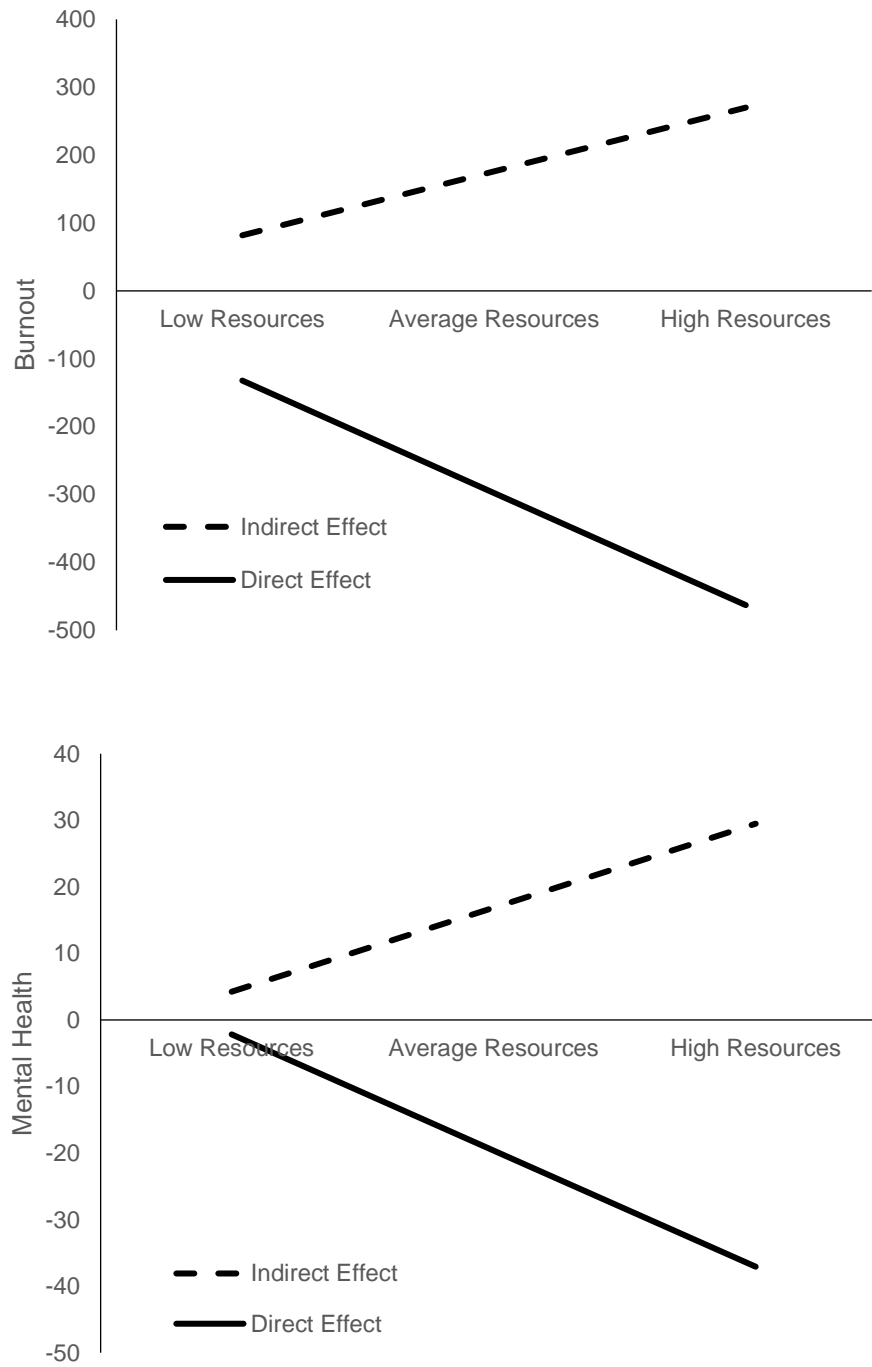


-0.17, $p = .431$, respectively. The simple slopes of low and high resources on mental health were not significant, $t(50) = 1.13$, $p = .868$, and $t(50) = -0.21$, $p = .42$, respectively. These paths suggest that individuals who have higher basic psychological needs satisfaction and higher levels of resources have lower physical and mental health symptoms, while those with higher basic psychological needs satisfaction and lower resources had higher physical and mental health symptoms in comparison to those who have lower demands. The relationship with lower levels of resources and higher basic psychological needs satisfaction is counter to previous research which suggests higher basic psychological needs satisfaction is associated with less strain outcomes. This may suggest that resources play a larger role than basic psychological needs satisfaction on strain outcomes at a between-level. The sixth grouping examined indirect effects of demands on strain through basic psychological needs satisfaction. None of these paths were significant. The seventh grouping examined the indirect effects of resources-moderated demands on strain through basic psychological needs satisfaction. None of these indirect effects were significant. The eighth group examined the indirect effects of resources-moderated basic psychological needs satisfaction on strain. None of the indirect effects were significant. As no indirect effects were significant, basic psychological needs satisfaction does not explain the full mediation relationship. Overall, the hypothesized model was partially supported at a between-level with the industrial group, in that resource-moderated demands impacted basic need satisfaction which in turn impacted strain outcomes. However, resource-moderated basic need satisfaction impacted strain but negatively impacted rather than positively impacted outcomes.

Hypothesis 2. The second hypothesis proposed is that the moderated mediation model would be significant at both the between- and the within-subject level. Therefore, within-subject paths are examined below. The same eight groupings of paths were examined but at the within-person level (see Table 9 and Figure 3). The first path examined the direct effect of demands on basic psychological needs satisfaction. This path was not significant, $\beta = -0.17, p = .122$. The second path examined the direct effect of resources-moderated demands on basic psychological needs satisfaction. This path was significant, $\beta = -0.18, p = .071, 95\% \text{ CI } [-0.32, -0.04]$ (see Figure 4). The simple slope of low resources was not significant, $t(217) = 0.04, p = .516$ but was significant for high resources, $t(217) = -1.53, p = .006$. This effect suggests that resources change the relationship of demands on basic psychological needs satisfaction, in that, individuals' higher levels or increases in resources and lower levels or decreases in demands increased levels of basic psychological needs satisfaction. Specifically, when demands are low or decreased over time, higher or increased levels of resources increased levels of basic psychological needs satisfaction. The third grouping examined the direct effects of basic psychological needs satisfaction on strain. Paths were significant from basic psychological needs satisfaction to burnout, $\beta = -0.33, p < .001, 95\% \text{ CI } [-0.48, -0.18]$, and mental health, $\beta = -0.40, p < .001, 95\% \text{ CI } [-0.52, -0.27]$, but not for physical health, $\beta = 0.04, p = .646$. Therefore, there were significant direct effects from resources-moderated demands to basic psychological needs satisfaction to strain. The fourth grouping of paths examined the direct effects of resources-moderated demands on strain. None of these paths were significant. The fifth grouping of paths examined the direct effects of resources-moderated basic psychological needs satisfaction on strain. The path

was not significant to burnout, $\beta = 0.08, p = .243$, but was significant for physical health, $\beta = 0.24, p = .006$, 95% CI [0.07, 0.41] and mental health, $\beta = 0.16, p = .005$, 95% CI [0.05, 0.28] (see Figure 7 and 8, respectively). The simple slopes of low and high resources on physical health were not significant, $t(217) = -1.03, p = .153$, and $t(217) = 0.81, p = .792$, respectively. The simple slope of resources on mental health was significant for lower resource levels, $t(217) = -2.95, p < .01$, but not for higher levels $t(217) = -0.68, p = .247$. In that, individuals whose resources were lower or decreased over time, yet increased their basic psychological needs satisfaction significantly, decreased their mental health symptoms and marginally decreased physical health symptoms. This suggests that basic needs satisfaction may play a larger role than resources in alleviating mental health symptoms and potentially physical health symptoms, at the within-level. It should be noted that although the slope graphically appears to be small, it has a small standard error which makes it, in fact, significant. The sixth grouping examined indirect effects of demands on strain through basic psychological needs satisfaction. The indirect paths of demands on all strain outcomes were not significant. The seventh grouping examined the indirect effects of resource-moderated demands on strain through basic psychological needs satisfaction. Indirect paths were significant to burnout, $B = 5.19, p = .009$, 95% CI [1.27, 9.11], and mental health, $B = 2.32, p = .018$, 95% CI [.39, 4.24], but were not significant for physical health, $B = -0.13, p = .652$. Direct and indirect paths are plotted in Figure 9. These significant indirect paths suggest that the relationship between within-level resources-moderated demands and mental and physical health are predominately explained through basic

Figure 9. Within-level moderated mediations paths on strain outcomes for the industrial group



psychological needs satisfaction. Specifically, the indirect effect suggests that when using basic psychological needs satisfaction to explain the relationship between resources and burnout and mental health symptoms, there is a negative relationship. That is, with increasing or higher levels of resources, strain outcomes decrease. However, the direct effect suggests that when controlling for basic psychological needs satisfaction, the effect is reversed. That is, more or increased demands (as well as resources) will still result in more strain outcomes. Therefore, basic psychological needs satisfaction is essential for understanding this relationship. The final, eighth grouping examined the indirect effects of resource-moderated basic psychological needs satisfaction on strain. None of these paths were significant.

Law Enforcement Group. As with the previous group, a null model of fixed effects was tested to represent baseline estimates. The null model for the law enforcement group indicated that all strain outcomes' within-person variances, between-person means, and between-person variances significantly varied at the $p < .001$ level. ICCs ranged from 0.68 to 0.86, suggesting the majority of variance explained is attributable to differences among people (see Table 10), with substantial variance (i.e., 14-32%) also explained by changes "within" people between time points. Then, control demographics were included to determine a R^2 to compare the models again (see Table 10). The between-person R^2 for each strain outcome ranged from 0.03-0.06, which were not significant. The within-person R^2 ranged from 0.001-0.002 and were not significant. This suggests that unlike the industrial group, the control variables and strain outcomes do not contribute significant variance to the proposed model at either the between- or within-level. Each independent variable, mediator, and interaction terms were added

Table 10.

Variance explained through model building for the Law Enforcement Group

	Basic Needs							
	Satisfaction		Burnout		Physical Health		Mental Health	
	ICC	R^2	ICC	R^2	ICC	R^2	ICC	R^2
Null Model	-	-	0.86	-	0.68	-	0.75	-
Controls Only	-	-	0.86	-	0.68	-	0.75	-
Between-Person	-	-	-	0.04	-	0.05	-	0.03
Within-Person	-	-	-	0.00	-	0.00	-	0.00
Between-Person Only	-	0.58***	0.86	0.72***	0.68	0.47***	0.75	0.62***
Within-Person Only	0.00	0.15***	0.00	0.04***	0.00	0.01*	0.00	0.03***
Full Model without Controls	0.00		0.88		0.70		0.77	
Between-Person		0.55***		0.70***		0.41***		0.61***
Within-Person		0.15***		0.26***		0.03*		0.12***
Full Model with Controls	0.00		0.88		0.70		0.77	
Between-Person		0.59***		0.71***		0.46***		0.61***
Within-Person		0.15***		0.27***		0.02*		0.12***

Note. * $p < .05$, ** $p < .01$, *** $p < .001$.

progressively to ensure R^2 increased at each step. R^2 increased at each step for the majority of the time. Both between- and within-person effects (Level 1 slopes and intercepts) were tested separately to ensure effects varied significantly across and within individuals, respectively. Significant between- and within-level paths were found suggesting employees' demands, resources, and basic psychological needs satisfaction varied amongst individuals and fluctuated week-to-week for each individual. This variation supports the nested structure of the data and continuing a multi-level approach and support testing variables that moderate Level 1 effects.

Hypothesis 1. Assessing whether resources attenuated the negative relationship of demands on basic psychological needs satisfaction as well as the negative relationship of basic psychological needs satisfaction on strain outcomes with the law enforcement group

were first examined without any controls. That is, the within- and between-effects models were combined without any control variables. Comparing the within-person results with the within-persons only model and the between-persons results with the between-persons only model, over half of the R^2 estimates decreased, while all still remaining significant. The R^2 decreases further justified why demographic controls were included within the model. All but one R^2 increased (i.e., within-person physical health).

To test both moderations within the moderated-mediation model, eight groupings of between-person paths were examined (see Table 11 and Figure 10). The first path examined the direct effect of demands on basic psychological needs satisfaction. This path was significant, $\beta = -0.47$, $p < .001$, 95% CI [-0.68, -0.26]. The second path examined the direct effect of resources-moderated demands on basic psychological needs satisfaction. This path was not significant, $\beta = 0.16$, $p = .125$. Therefore, resources did not attenuate the relationship between demands and basic psychological needs satisfaction. The third grouping examined the direct effects of basic psychological needs satisfaction on strain. Paths were significant from basic psychological needs satisfaction to burnout, $\beta = -0.65$, $p < .001$, 95% CI [-0.84, -0.47], physical health, $\beta = -0.43$, $p = .008$, 95% CI [-0.75, -0.11], and mental health, $B = -0.68$, $p < .001$, 95% CI [-0.92, -0.44]. Therefore, there were direct effects from demands to basic psychological needs satisfaction to strain outcomes, supporting the mediation model. The fourth grouping of paths examined the direct effects of resources-moderated demands on strain. None of these paths were significant. The fifth grouping of paths examined the direct effects of resources-moderated basic psychological needs satisfaction on strain. Paths were

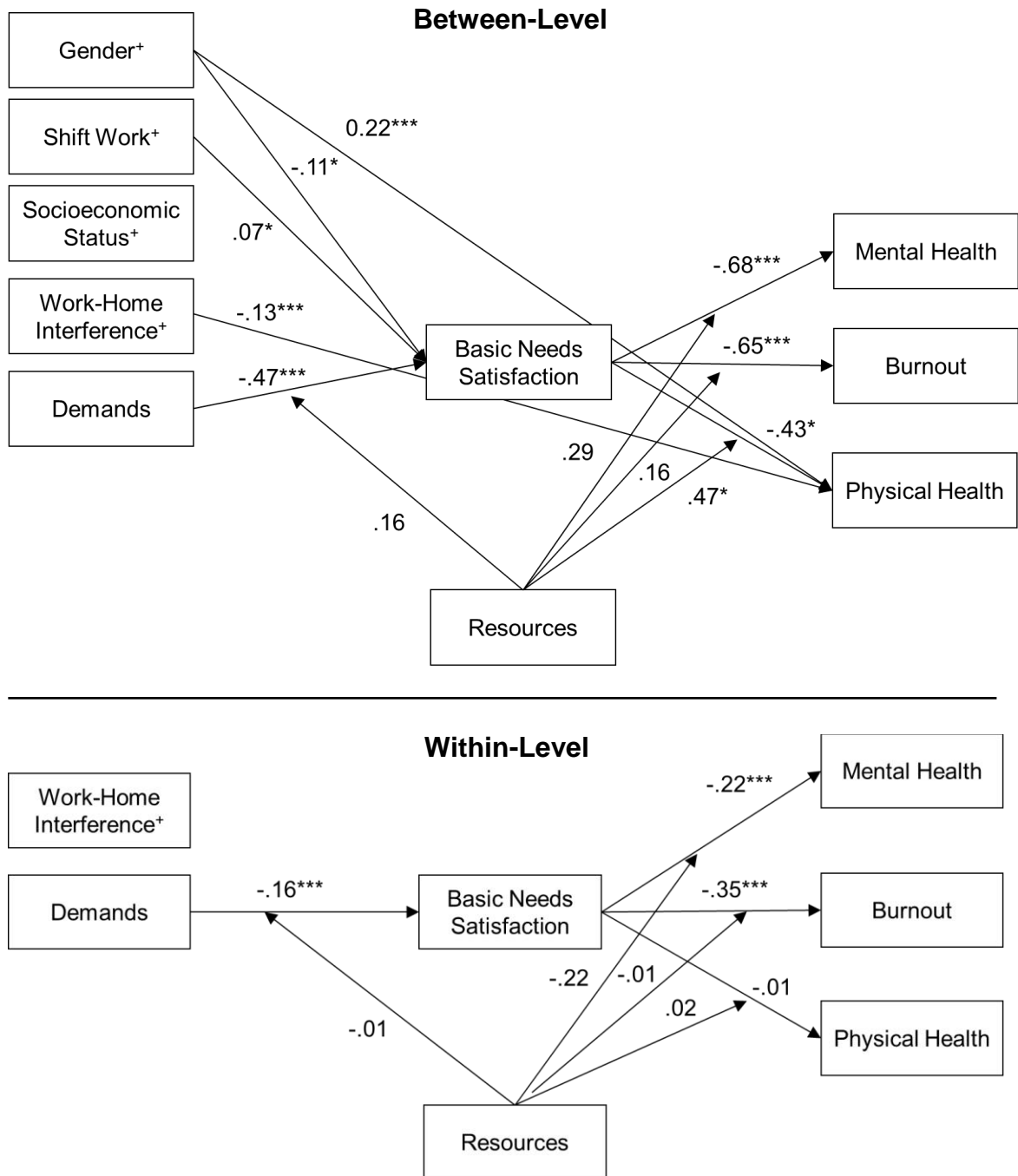
Table 11.

Full model estimates of the strain outcomes for the law enforcement group

Variables	Means	Variances	Basic Needs Satisfaction		Burnout		Physical Health		Mental Health	
			β	SE	β	SE	β	SE	β	SE
Between-Person										
Gender	1.47	0.26	-0.11*	0.05	-0.03	0.04	0.22***	0.06	0.00	0.04
Shift	1.26	0.19	0.12*	0.05	0.07	0.04	0.10	0.06	0.03	0.05
Socioeconomic Status	2.27	0.24	0.07	0.05	0.02	0.04	-0.10	0.06	-0.08	0.04
Work-Life Interference	1.25	2.29	-0.02	0.05	0.03	0.02	-0.13***	0.03	-0.05	0.03
Demands	1.25	0.18	-0.47***	0.11	0.17	0.11	0.14	0.22	0.27	0.20
Resources	1.55	0.27	0.40***	0.10	-0.24*	0.11	-0.47*	0.22	-0.11	0.22
Basic Needs Satisfaction	0.28	0.30	-	-	-0.65***	0.09	-0.43**	0.16	-0.68***	0.12
Demands \times Resources	1.84	0.44	0.16	0.11	0.11	0.10	0.32	0.19	-0.01	0.19
Basic Needs Satisfaction \times Resources	0.62	0.96	-	-	0.16	0.12	0.47*	0.18	1.29	0.17
Within-Person										
Work-Home Interference	-0.00	0.94	0.04	0.03	0.03	0.02	0.01	0.03	0.03	0.02
Demands	-0.00	0.06	-0.16***	0.05	0.22***	0.04	0.15***	0.03	0.21***	0.03
Resources	0.00	0.04	0.33***	0.04	-0.13***	0.03	-0.00	0.04	-0.01	0.04
Basic Needs Satisfaction	0.00	0.05	-	-	-0.35***	0.04	-0.01	0.04	-0.22***	0.04
Demands \times Resources	-0.01	0.00	-0.01	0.04	0.03	0.04	-0.00	0.05	0.06	0.04
Basic Needs Satisfaction \times Resources	0.02	0.00	-	-	-0.01	0.05	0.02	0.05	0.02	0.05

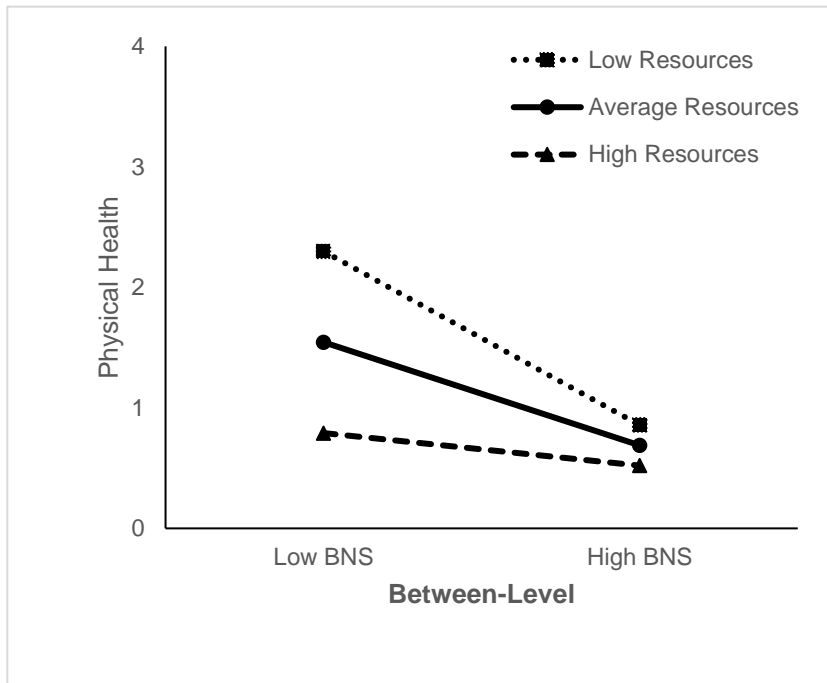
Note. * $p < .05$, ** $p < .01$, *** $p < .001$. Gender: 1 = Male, 2 = Female; Shift: 1 = No, 2 = Yes.

Figure 10. Standardized path coefficients for the law enforcement group



Note: * $p < .05$, ** $p < .01$, *** $p < .001$. Gender: 1 = Male, 2 = Female; Shift: 1 = No, 2 = Yes. ⁺Only significant paths are shown for controls. All path coefficients are for the final step model. Indirect effects of between-level demands through basic psychological needs satisfaction on burnout, $B = 12.65^{***}$, physical health, $B = 0.92^*$, and mental health $B = 3.84^{**}$ were significant. The indirect effects of within-level demands through basic psychological needs satisfaction on burnout and mental health were significant, $B = 1.51^{**}$ and $B = 0.38^*$, respectively. No other indirect effects were significant.

Figure 11. Interaction of resources-moderated basic psychological needs satisfaction on physical health for the law enforcement group



significant to physical health, $\beta = 0.47$, $p = .010$, 95% CI [0.11, 0.83] (see Figure 11), but not for burnout, $\beta = 0.16$, $p = .183$, or mental health, $\beta = 0.29$, $p = .090$. The simple slopes for both low and high resources on physical health were not significant, $t(226) = -0.78$, $p = .220$, and $t(226) = -0.11$, $p = .458$, respectively. That is, individuals with higher levels of resources have a greater number of physical health symptoms across all levels of basic psychological needs satisfaction. The sixth grouping examined indirect effects of demands on strain through basic psychological needs satisfaction. The indirect effects of demands on burnout, $B = 12.65$, $p < .001$, 95% CI [6.07, 19.23], physical health, $B = 0.92$, $p = .039$, 95% CI [0.05, 1.79], and mental health $B = 3.84$, $p = .003$, 95% CI [1.27, 6.42] were significant. The seventh grouping examined was the indirect effects of resources-moderated demands on strain through basic psychological needs satisfaction. None of

these paths were significant. The eighth grouping examined the indirect effects of resources-moderated basic psychological needs satisfaction on strain. None of these indirect effects were significant. As no indirect effects for the moderation relationships were significant, this model does not explain the full mediation relationship. Overall, the hypothesized model was only partially supported with the law enforcement group. In that, resources moderated basic psychological needs satisfaction which in turn impacted strain outcomes, specifically physical health. This was found as a direct mediation effect. However, resources did not moderate the relationship of demands to basic psychological needs satisfaction.

Hypothesis 2. The second hypothesis proposed that the moderated mediation model would be significant at both the between- and the within-subject level. The same eight groupings of paths from the between-level analyses were examined at the within-level (see Table 9 and Figure 11). The first grouping examined the direct effect of demands on basic psychological needs satisfaction. This path was significant, $\beta = -0.16$, $p < .001$, 95% CI [-0.25, -0.07]. The second path examined the direct effect of resources-moderated demands on basic psychological needs satisfaction. This path was not significant, $\beta = -0.01$, $p = .793$. The third grouping examined the direct effects of basic psychological needs satisfaction on strain. Paths were significant from basic psychological needs satisfaction to burnout, $\beta = -0.35$, $p < .001$, 95% CI [-0.43, -0.28] and mental health, $\beta = -0.22$, $p < .001$, 95% CI [-0.30, -0.14], but not for physical health, $\beta = -0.01$, $p = .835$. The fourth grouping of paths examined the direct effects of resources-moderated demands on strain. None of these paths were significant. The fifth grouping of paths examined the direct effects of resources-moderated basic psychological needs

satisfaction on strain. None of these paths were significant. The sixth grouping examined indirect effects of demands on strain through basic psychological needs satisfaction. The indirect effects of demands on burnout, $B = 1.51$, $p = .003$, 95% CI [0.50, 2.53], and mental health outcomes, $B = 0.38$, $p = .010$, 95% CI [0.09, 0.68] were significant, but not for physical health, $B = 0.01$, $p = .834$. The seventh grouping examined the indirect effects of resource-moderated demands on strain through basic psychological needs satisfaction. None of these indirect effects were significant. The eighth grouping examined was the indirect effects of resource-moderated basic psychological needs satisfaction on strain. None of these indirect effects were significant. Overall, although there was some evidence of mediation and moderation with the law enforcement group, but the overall hypothesized model was not supported.

Alternative Models

To further determine that the hypothesized model is supported by this data, alternative models were tested. First, in examining the modification indices of both the industrial group and the law enforcement group, significant chi-square decreases were expected if between-level strain outcomes were regressed onto basic psychological needs satisfaction. Because this is the opposite path direction hypothesized, a reverse causation model was examined. That is, demands and resources were regressed onto strain then strain was regressed onto basic psychological needs satisfaction. This model conceptualizes that it is strain that is causing basic psychological needs to become unsatisfied rather than the lack of resources or increase of demands. For the industrial and law enforcement group, the reverse causation model had poorer R^2 than the hypothesized model for the vast majority of both the between- and within-person

estimates than the hypothesized model (see Table 12). However, R^2 were still high enough to warrant a discussion of whether these estimates warrant a discussion on loss or gain cycles.

Table 12.

Alternative model R-square values for strain outcomes across 5 weeks

Model	R^2 Range		AIC	BIC	ICC
	Within-Person	Between-Person			
Industrial Group					
1a. Hypothesized Model	0.14 – 0.38	0.56 – 0.90	3,503.25	3,759.46	0.59 – 0.84
2a. Reverse Causation	0.06 – 0.80	0.48 – 0.87	3,745.50	3,950.31	0.65
3a. Separated Basic Needs	0.07 – 0.85	0.29 – 0.97	4,368.25	4,792.73	0.64 – 0.82
4a. Lagged Model	0.19 – 0.99	0.51 – 0.95	2,246.84	2,309.49	-
Law Enforcement Group					
1b. Hypothesized Model	0.12 – 0.27	0.46 – 0.71	14,771.28	15,136.69	0.70 – 0.88
2b. Reverse Causation	0.03 – 0.24	0.32 – 0.70	17,335.80	17,638.13	0.83
3b. Separated Basic Needs	0.03 – 0.16	0.20 – 0.73	17,437.26	18,036.53	0.69 – 0.88
4b. Lagged Model	0.12 – 0.69	0.51 – 0.70	739.69	1,897.56	-

Note. χ^2 and other model fit indices are not provided because comparing model fit is not appropriate due to their multi-level nature (see Ryu, 2014). To compare models, higher R^2 , lower AIC and BIC values, and significant estimates within the model were examined.

Another plausible model from previous research (e.g., Reis et al., 2000, Sheldon et al., 1996) is examining basic psychological needs satisfaction with the need for competence, autonomy, and relatedness components separated. Although there were differences between some of the components being significant while others were not, overall R^2 was not better than the hypothesized model (see Table 12). For the industrial and law enforcement group, the separated needs model had poorer R^2 than the

hypothesized model for the vast majority of both the between- and within-person estimates.

Finally, a lagged model was examined to determine whether any effects may be stronger over time. For example, does resources-moderated demands impact basic psychological needs satisfaction one week in the future rather than immediately or cumulatively. The tested lagged model examined each weekly diary study on zero to four weeks after the first survey. The lagged model showed better R^2 for the majority of estimates over the hypothesized model for both the industrial group and the law enforcement group (see Table 12). As the lag increased, week-by-week, the R^2 increased for basic psychological needs satisfaction. However, due to the long-format of the data, large amounts of missing data, and a greater number of parameters than variables, many errors arose during this analysis. For example, the covariance matrix could not be inverted, and therefore, some indices were not reported on, such as ICCs. For both groups there were many significant interactions with resources-moderated demands and resources-moderated basic psychological needs satisfaction, however, there was no consistent trend across weeks. That is, there wasn't a consistent "one-week" or "three-week" lagged trend for either group nor were the same paths significant consistently within or across each group. As noted, because the errors identified, any lagged effects may not be trustworthy, but are worthy of further discussion below.

Discussion

The short- and long-term effects of workplace stress can be devastating to employees and organizations. This research aimed to outline what stress is, evaluate why people experience it, and provide a test for why one person experiences it differently than

another. This was done by outlining the evolution of stress theories that eventually became the job demands-resources model, in which stress is viewed as a process rather than simply a one-time feeling or experience. To better understand why we experience stress, basic psychological needs satisfaction from self-determination theory was proposed as the mediator between job demands and strain outcomes—suggesting it is a lack of needs being satisfied rather than the demands themselves which give rise to strain outcomes. To attempt to understand why individual experience stress differently from one another, a dynamic double-moderation model was proposed to examine how people continuously utilize their resources in stressful work situations.

The first major finding of this research was that there were significant differences between the study groups preventing generalizations to be made about the proposed hypotheses. That is, the model was not supported with all participants combined into one dataset. The groups significantly differed on demands, resources, basic psychological needs satisfaction, and all strain outcomes. Therefore, experiences of stress and strain differ not only by individual, but also by organization or sector. This will be discussed further in the upcoming sections. Analyses were, therefore, conducted with the study groups separated.

The second major finding concerned basic psychological needs satisfaction as a mediator to explain why individuals feel stress. For the industrial group, there were direct effects, specifically from resources-moderated demands through basic psychological needs satisfaction on physical and mental health. This direct effect was significant between-people not just for resources-moderated demands on strain outcomes, but also for demands on strain outcomes. There were also indirect effects at the within-level for

the majority of strain outcomes. Overall, there was partial mediation, in that, basic psychological needs satisfaction partially explained the relationship of resources-moderated demands onto certain strain outcomes. Finding mediation across multiple time sessions strengthens support that mediation is truly occurring rather than individual differences contributing to a single time-point (Maxwell et al., 2011). These significant indirect paths suggest the relationship between resources-moderated demands and mental and physical health are predominately explained through basic psychological needs satisfaction. Specifically, the indirect effect suggests that when using basic psychological needs satisfaction to explain the relationship between resources and burnout as well as mental health symptoms, there is a negative relationship. That is, through either increasing or maintaining higher levels of resources, strain outcomes decrease. However, the direct effect suggests that when controlling for basic psychological needs satisfaction, the effect is reversed. That is, more or increased demands (as well as resources) will still result in more strain outcomes. Therefore, basic psychological needs satisfaction is essential for understanding this relationship and for reducing strain outcomes with this group. This emphasized the impact and importance of understanding individuals' own subjective appraisals.

For the law enforcement group, no direct or indirect effects of resources-moderated demands on strain outcomes were significant. However, there were direct and indirect effects of demands on strain outcomes through basic psychological needs satisfaction. Overall, there was partial mediation of basic psychological needs satisfaction explaining the relationship of demands onto strain outcomes. That is, no matter how satisfied this group's basic psychological needs were or how many resources

were utilized, the demands were unique or extreme enough to continue to be associated with higher levels of strain.

Therefore, there was evidence for both the stress-buffering effect (i.e., the moderation effect of resources attenuating the effect of demands) with the industrial group and the health impairment process (i.e., the direct effect of demands on strain) with the law enforcement group. This result may be consistent with the findings that more homogenous groups have specific demands that are not moderated by resources (e.g., Boudrais et al., 2011). Moreover, although the law enforcement group was not solely made up of first responders, there may be unique issues with their exposure to extreme demands that could impact the whole organization.

Third, it was hypothesized that resources would attenuate the negative relationship of demands on basic psychological needs satisfaction (Hypothesis 1a) as well as the negative relationship of basic psychological needs satisfaction on strain outcomes (Hypothesis 1b). Resources played a significant role amongst individuals in the industrial group but not the law enforcement group. That is, Hypothesis 1 was supported or partially supported for the industrial group but not the law enforcement group. Specifically, individuals who, on average, had lower resources, regardless of amount of demands, had lower basic psychological needs satisfaction. Therefore, resources played a more impactful role than demands on influencing basic psychological needs satisfaction with the industrial group at a between-level. With the law enforcement group there were significant relationships of demands and resources impacting basic psychological needs satisfaction but resources did not buffer the effects of demands. That is, resources did not alleviate, or moderate, the impact of demands. For the most part, additional resources

resulted in alleviated strain symptoms, partially supporting Hypothesis 1b. Specifically, it should be noted that sometimes results were counter to the hypotheses. For example, with the industrial group, between-level basic psychological needs satisfaction was moderated by higher levels of resources resulting in higher physical symptoms. That is, higher basic needs satisfaction and higher resources were associated with increased physical symptoms. There is a possibility that temporal order may impact this finding. For example, perhaps those with greater symptoms start to seek more resources. This unexpected relationship was not seen at the within-level. Generally, overall higher levels of demands impacted basic needs satisfaction and resulted in increased strain, but if the individual increased their utilization of resources, they would, generally, decrease their levels of strain. This highlights the importance of understanding the stress phenomena at an individual-level.

Fourth, it was hypothesized that the moderated mediation relationships found at the between-level would also be found at a within-level (Hypothesis 2). Specifically, at a person-level, increasing one's resources would improve one's basic need satisfaction (Hypothesis 2a) and alleviate strain symptoms (Hypothesis 2b). There was significant within-level interactions for the industrial group but not the law enforcement group. That is, for the industrial group strain outcomes alone didn't explain fluctuations of people's experiences of stress. However, strain outcomes alone contributed to a significant proportion of variance explaining differences between people. This is similar to previous research that found approximately 50% of strain variance attributable to the individual level (van Veldhoven et al., 2005). For the law enforcement group, within-level demands and resources significantly impacted basic psychological needs satisfaction, but not in

conjunction with one another. Therefore, Hypothesis 2a was partially supported.

Resources-moderated basic psychological needs satisfaction only had significant paths onto strain for the industrial group at the within-level. Physical health was impacted similarly to the between-level, but mental health was also impacted at this level. Overall, Hypothesis 2b was also partially supported.

Finally, although causality cannot be inferred, structural equation modelling can help support causality arguments. Specifically, Frazier, Tix, and Barron (2004) suggest the following is needed to aid in supporting causality: covarying variables, temporal causal ordering, and sources of spurious covariation are eliminated. These elements were examined and alternative models were also conducted to test reverse causation models and lagged models and eliminate alternative explanations. Modification indices were also examined for any relationships that may have been overlooked. Therefore, there is strong reasoning to believe the structural model of this research is sound and that researchers and practitioners can assume that the traditional stressors-stress-strain model is the correct causal sequence. Understanding this sequence may be able to help researchers understand how long-term clinical mental health or physical conditions begin to develop.

In summary, the proposed hypotheses were mostly supported in the industrial group, but not consistently supported in the law enforcement group. Therefore, not all stress and strain are equal amongst organizations or individuals. This research aimed to better understand why some individuals experience strain while others do not under seemingly identical demands. This was examined through both between- and within-person levels using a diverse workforce across multiple time-points. The within-person analysis demonstrated that strain outcomes covary with changes in an individual's

demands and resources, while the between-person analysis showed for whom the average effect holds. That is, the research showed that having more resources sometimes will buffer (or lessen) the negative impact of job demands on basic psychological needs satisfaction for each individual. At other times, demands and resources will impact an individual's basic psychological needs satisfaction, but it is not a canceling-out, or buffering, effect. Furthermore, if basic psychological needs were not satisfied, utilizing more resources helped lessen the negative impact on the individual's physical and psychological strain outcomes for some, but not others. Other factors may be impacting people differently and for different reasons.

Contributions to Practice

These research findings suggest that not all stress is equal. Specifically, this study showed that the interpretation and the impact of stress varied by organization and by person. That is, reducing demands or increasing resources will not consistently benefit the individual or reduce their stress. The interpretation of demands or the identification of resources differs person-by-person and that impacts the interpretation of whether their basic psychological needs are being satisfied. However, basic psychological needs satisfaction was always significantly related to at least one strain outcome and was at least partially, if not fully, explaining the relationships between demands and resources-moderated demands with strain outcomes. This suggests it is not enough to increase resources or reduce demands for an employee, but it is also necessary to understand that individual's interpretation of that stress and how that impacts their basic psychological needs satisfaction. Resources also played a vital role, particularly at a between-level. Therefore, any interventions should be geared towards satisfying employees' basic

psychological needs and increasing their utilization of resources. This is also potentially why individuals in seemingly identical work conditions display different stress responses. Thus, organization-wide initiatives are likely to fail to reduce strain if they don't account for people's individualized needs. Any organizational interventions should be targeted at the employee- and manager-level. Managers and employees can cooperatively determine ways to design the employee's role in order for employees to feel satisfied in their basic psychological needs. For example, if the employee doesn't feel they are demonstrating their educational background or their level of intelligence, the manager can assign them to a special project or bring them into meetings where decisions are being made. Or if the employee doesn't feel they have support, they can seek out a mentor to help them through situations where their manager or colleagues may not be present. Because we found basic psychological needs satisfaction fluctuates week-to-week, it is recommended that the discussion of the employee's stress and basic psychological needs satisfaction be incorporated into existing weekly one-on-one meetings between the employee and the manager.

Incorporating these suggestions into stress-reduction interventions at work may help increase their effectiveness. Interventions should focus on the individual, and specifically, whether resources are being utilized and their basic psychological needs are being satisfied. That is, do they feel capable of managing or even mastering challenges? Do they feel able to voice their opinions or act with a sense of volition? And, do they have support from people that are close with them? It is essential that all three of these needs are met. Employees can also proactively "job craft" their work environment to better meet their needs. That is, employees can adjust elements of their job and

relationship to others to change the meaning of their work and their environment (Wrzeniecki & Dutton, 2001). For organizations with more homogeneous job demands, organization or job redesign may be warranted to address common concerns. However, adjustments should then be made to ensure an inclusive job design to meet individual needs.

Additionally, because some variables significantly correlated with certain demographic variables such as work-home interference, stress-reduction interventions are important to be translated to all spheres of life. That is, ensure stress interventions include discussions or provide resources that support basic psychological needs are being met at home and at work so that any interventions may help reduce the impact of any potential spillover effects.

Contributions to Knowledge

From a theoretical standpoint, this research shines light on why there may be discrepancies in the job demands-resources model, particularly whether there are moderating effects or not (e.g., Bakker et al., 2005; Bakker et al., 2010; Boudrais et al., 2011; Xanthopoulou et al., 2007). That is, there may be additional underlying individual mechanisms like basic psychological needs satisfaction that are playing a mediation role. Specifically, there was evidence for both the stress-buffering effect and the health impairment process, depending on the group studied. This result may be consistent with the findings that more homogenous groups have specific demands that are not moderated by resources (e.g., Boudrais et al., 2011). This is particularly important with homogeneous groups that face more extreme work environments (e.g., toxic work cultures, risks of violence and aggression, bullying, sexual harassment, etc.). Overall,

future theoretical advancements of workplace stress need to include the subjective, individual interpretations of stress, particularly focusing on basic psychological needs satisfaction as well as how homogenous the workgroup is.

This research also adds to the literature in testing the dynamism of the stress. Specifically, how does one experience strain when their own demands or resources fluctuate? And why do some individuals experience strain while others do not when under seemingly identical conditions? Generally, the amount of and adjustment of resources impacted not only one's basic psychological needs satisfaction but also one's strain outcomes. However, this varied by organization and by individual. Resources are utilized throughout the stress appraisal process—not just at one point-of-time. This suggests that interventions are needed during and after the stressful event to lessen the impact both on basic psychological needs satisfaction and strain. Therefore, a continuous appraisal and adjustment is needed in order to reduce future impacts on not only the employee but also the organization.

Limitations and Future Research

While this research strived to overcome limitations of past research by including multiple organizations, using a diary study, and studying stress with a dynamic model, this study has its own limitations. A major limitation of this research is the lack of generalizability. Specifically, the hypotheses were supported with one group but not another. It may be that the law enforcement group is an atypical workplace, specifically in that physical safety threats and tragic events are commonplace. For example, self-determinism theory was created to describe intrinsic motivation and well-being (Deci & Ryan, 2000). Therefore, extreme events like safety risks, harassment, and bullying may

be out of scope of this theory. Additionally, mental health issues such as acute stress disorder or post-traumatic stress disorder are likely more prevalent with the law enforcement group. Mental health disorders could potentially impact the underlying mechanism of how stress is interpreted or coped with. Future research should examine how preexisting or current diagnoses can impact the interpretation of demands, resources, and basic psychological needs satisfaction.

Additionally, despite short-term sampling, participants may still have experienced survey fatigue. Reis and Gable (2000) suggested that daily assessments should not exceed 15 minutes, whereas this study, on average, took 30 minutes to complete for the first survey and 21 minutes for subsequent surveys. Individuals who dropped out after the first survey significantly differed from those who remained on age, whether they worked shift work, and the first time-point for burnout. That is, those who were younger, worked shift work, and/or indicated higher burnout on the first survey were more likely to drop out. Therefore, there may be some restriction of range of the participants who remained within the survey. Future research could try to overcome this limitation through experience or event sampling (e.g., Ohly et al., 2010, Sonnentag & Biessen, 2008). Event sampling can also help address within-person differences by examining antecedents, correlates, and consequences of the variables that fluctuate for the individual at the time of the event (Sonnentag & Geurts, 2009). Future research could also reduce the survey length to less than 15 minutes to try and combat survey fatigue.

Future research may also be interested in examining objective measures within this model. For example, some demands, resources, and outcomes could have been objectively measured. And while some objective outcomes such as physical health

complaints were examined, all information was self-disclosed by the participants. Cote and Buckley (1987) found that up to a quarter of variance may be due to systematic sources of measurement error like common method bias. Furthermore, future research may benefit from using objective measures such as job performance rated by the supervisor, days absent, or the number of calls to an Employee Assistance Program. Using these types of objective measures will also help organizations quantify how stress is impacting their bottom line. The subjective nature of this study may create discrepancies in actual versus perceived capacity for a job. However, given that the experience of one's basic psychological needs satisfaction is subjective and psychological in nature, an objective measure of this construct is not possible. At times, there has also been evidence that subjective appraisals of stress-related variables are better predictors than objective measures (Repetti, 1987; Solomon, Mikulincer, & Hobfoll, 1987).

Although there was no evidence for the non-linearity or subfactors of resources, there was evidence of unique properties among some of the subcomponents. That is, skill variety and skill use appeared to be related to within-person fluctuations based on organization attributes. Future research should be cognizant of this when examining the job demands-resources model and ensure the resources load onto one factor. Another possible explanation could be demands or resources as a non-linear solution. Recent research found that within an exploration of job demands-control model over a 10-year period a quadratic solution could be argued for (Igic, Keller, Elfering, Tschan, Kälin, & Semmer, 2017). The researchers found that challenge stressors may be perceived as rewarding in the short term, but eventually develop into negative effects. Examining this

study's model over a longer time period or with a lagged model would be beneficial to better understanding these phenomena.

Future research may also benefit from creating scales that further tease apart the differences between resources and basic psychological needs satisfaction. For example, within this study, items pertaining to autonomy as resources were used as well as items pertaining to need for autonomy. These items were meant to examine an autonomy supportive environment versus the perception of having one's need for autonomy met. Another example, is re-examining what truly is a resource. For example, at a certain level too much decision-making power may become a demand rather than a resource. This is akin to the literature that teases apart challenge versus hindrance demands. Additionally, examining other potential resources such as Employee Assistance Programs, whether they have a mentor, and possession of positive personal resources (e.g., self-efficacy) could provide additional insight. Teasing apart these variables will help reduce the strong intercorrelations and potentially help combat any statistical suppression in future studies. Future scales should further test and tease apart these components to ensure uniqueness among variables.

Future research may benefit from examining this model across a longer time period. This current research attempted to reduce seasonal impacts and weekly effects by staggering when the survey was administered to groups. However, given that this survey was only five weeks in duration, any long-term impacts cannot be discussed. For example, many within-person physical health changes were not significant in this shorter time period. A lagged model was examined but others may be viable, provided theoretical justification. For example, there was some evidence for reverse causation or a

potential lagged effect on both basic psychological needs satisfaction and strain outcomes, however sample size made estimates unreliable. Future research should examine long-term effects to determine whether there may be loss or gain spirals (e.g., Bakker & Demerouti, 2017; Hobfoll, 1998), residual effects (e.g., Fuller, Stanton, Fisher, Spitzmüller, Russell, & Smith, 2003; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003; Schaufeli, Bakker, & van Rhenen, 2009), or cross-level mediation or moderation (e.g., Jex & Bliese, 1999; Sonnetag, Mojza, Binnewies, & Scholl, 2008). Using longer-term sampling would also allow for growth modeling. If conducted, these analyses would require large samples sizes to ensure clusters are greater than the number of parameters.

More research is required to understand the demographics that are significantly correlated with the study variables and contributed to significant *R*-square increases. For example, gender was related to job demands and physical health outcomes, and work-home interference was related to job resources, basic psychological needs satisfaction, and all of the strain outcomes. While some researchers have not seen any relationships with gender (e.g., Reis et al, 2000; Sheldon et al., 1996), others have (e.g., van der Broeck et al., 2008). For instance, different genders may have differing work-life interference (e.g., Lyness & Judiesch, 2014), locus of control (e.g., Gianakos, 2002; Karkoulian, Srour, & Sinan, 2016), or may use different coping mechanisms (e.g., Zwicker & DeLongis, 2010). It is possible that these inconsistent findings could suggest a third-variable correlation such as college education (Tausig, Fenwick, Sauter, Murphy, & Graif, 2005) or socioeconomic status. Another limitation pertaining to demographics related to income. The samples in this study has approximately twice the level income and family income as the average Canadian. Although income was not related to study

variables and socioeconomic status was controlled for, there is the possibility that there is a restriction of range of the variables examined. Future research should investigate theoretical explanations for why either stressors or strain outcomes could be related to gender and/or socioeconomic status and examine a full-breadth of income range. It should be noted that within this research demographics were controlled, where possible, to still be able to test the analyses. However, when trying to examine results split by demographics, thereby adding additional complexity, greater statistical power or sample size is needed. This is another limitation future researchers may experience or improve on when examining third variable problems or cross-level mediation or moderation (Mathieu & Chen, 2011).

Although MSEM combines the benefits of MLM and SEM, there continues to be multiple limitations. First, typically MSEM assumes that the indirect effect is composed equivalently of the within- and between-effect—which is hard to justify theoretically (Preacher et al., 2010). Although this is how these variables were hypothesized, there is a risk of incurring nontrivial bias for the indirect effect (MacKinnon, 2008; Zhang, Zypher, & Preacher, 2009). Additionally, MSEM permits separate unbiased estimates of the between- and within- components, and therefore, these components may be conflated (Bauer et al., 2006). The statistical software was also limited in its functionality. For example, the software was unable to test randomized slopes and conduct multiple imputation concurrently. Additionally, imputation-based test statistics were used rather than FIML, and imputation-based tests typically show lower power, particularly with high levels of missing data (Enders & Mansolf, 2018). There were further difficulties in testing the alternative lagged model based on the number of parameters and missing data

involved. Future development of statistical software is recommended in order to accommodate complex models such as MSEM that includes moderation and mediation, particularly with cross-level lagged mediation and moderation.

Finally, strain and well-being are not opposite ends of a continuum (Keyes, 2003). Future research should examine these results either with, or alongside, the presence of positive symptoms. These positive attributes could include job satisfaction, engagement, or life satisfaction. It should be noted that the statistical complexity of measuring both negative and positive outcomes may prove cumbersome with existing analytic tools. Therefore, researchers may need to develop more advanced statistical programs or reduce this model's complexity in order to test such analyses.

Conclusion

Overall, this research shows that not all individuals experience stress in the same way. Specifically, how job demands and resources impact individual's basic psychological needs satisfaction not only differed by organization, but also differed by individual. This research found that understanding an employee's job demands and resources is important, but understanding how these aspects are affecting them personally, particularly with their basic psychological needs satisfaction, is more important to help reduce strain outcomes. Additionally, when attempting to alleviate strain symptoms, it's important to work with the individual to help them increase their utilization of resources and satisfy their basic psychological needs. This research provides clarity to the existing research on how to reduce the impact of workplace stress on employees and organizations and provides practical solutions on how workplaces can

help people satisfy their basic psychological needs through achievable challenges, collective purpose, role identity, social interaction, and support.

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Appendix A

Survey Communication

ASSESSING STRESS IN THE WORKPLACE INFORMED CONSENT

(REB File #15-214)

Principal Investigator: Lauren Florko
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Phone: (902) 491-6356 Email: stress@smu.ca
Faculty Supervisor: Dr. Lucie Kocum

INTRODUCTION AND PURPOSE OF THIS RESEARCH

You are invited to participate in the Assessing Stress in the Workplace Survey. The purpose of this study is to better understand why individuals experience stress in their workplace. This study will examine a new workplace stress model with a working population.

WHO IS ELIGIBLE TO PARTICIPATE IN THIS STUDY?

To be eligible to participate in this part of the study, you must be 18 years of age or older, and must be currently employed. If you are currently retired or unemployed you are not eligible to participate in this research.

WHAT DOES PARTICIPATING MEAN?

This study will take place over five weeks. You will receive a survey once per week, each taking about 20 minutes to complete (with the first survey taking an extra 5 minutes for demographic questions). In all, the full study will take about 100 minutes to complete. You will be asked demographic questions about yourself, your current job as well as questions pertaining to work conditions and personal outcomes. To link the weekly surveys you will be asked for your email. Once all data is collected your email will be stripped from the data to disassociate the information. You will not be asked to disclose any identifying information about yourself or your employer, and you have the option to skip any questions that you do not feel comfortable answering.

WHAT ARE THE POTENTIAL BENEFITS OF THIS RESEARCH?

The findings of this study will provide results to why individuals may experience stress at work. Any implications of these results will be used to advocate for better workplace interventions. These results will be used to help better understand stress in the workplace both theoretically and practically.

WHAT ARE THE POTENTIAL RISKS FOR PARTICIPANTS?

There is no danger of physical or social risk to you as a consequence of your participation in this study. Some aspects of the study may cause you some discomfort or stress. We also ask that you notify us at 902-491-6356 or by email at stress@smu.ca if you experience any discomfort during or after the survey. You will be provided with a list of services that you can consult.

COMPENSATION FOR PARTICIPATION

You will be compensated from this study with a tailored report. After completing Week 5's survey, a report will be generated outlining your fluctuating work demands, resources, and personal outcomes.

HOW CAN I WITHDRAW FROM THIS STUDY?

You may withdraw your consent at any time without penalty and you may choose to skip questions that you do not feel comfortable answering. If you wish to withdraw any previously submitted responses, please email us at stress@smu.ca.

WHAT WILL BE DONE WITH MY INFORMATION?

All information you provide will be stored online with a survey-host, Qualtrics and on a password-protected computer. Qualtrics encrypts and stores data in Ireland. Data stored online will not be shared by Qualtrics to any third parties. The computer-transferred data will be retained for a minimum of 5 years after publication. Individual information will not be shared outside the research team and results will be reported in aggregate (group-level) form only. The information you provide will be used to understand stress in the workplace as well as to help formulate future research ideas and directions. Moreover, it is anticipated that the findings of this study will be presented to the scientific community through conferences, scientific papers, newsletters, brochures, and workshops.

HOW CAN I FIND OUT MORE ABOUT THIS STUDY?

If you should have further questions about this study, please contact our research team by phoning (902) 491-6356 or email the Principal Investigator at stress@smu.ca. If you would like to be informed of the results of this study, please contact us at stress@smu.ca in January 2016.

Certification:

This research has been reviewed and approved by the Saint Mary's University Research Ethics Board. If you have any questions or concerns about ethical matters pertaining to this study, you may contact the Chair of the Saint Mary's University Research Ethics Board at ethics@smu.ca or 902-420-5728.

I understand what this study is about and appreciate the risks and benefits. I have had adequate time to think about this and have had the opportunity to ask questions. I understand that my participation is voluntary and that I can end my participation at any time

- I refuse to participate
- I agree to participate

If I refuse to participate Is Selected, Then Skip To End of Survey

Email address _____

REMINDER OF RESEARCH RIGHTS

ASSESSING STRESS IN THE WORKPLACE

(REB File # 15-214)

Principal Investigator: Lauren Florko
Dept. of Psychology, Saint Mary's University, Halifax, NS B3H 3C3
Phone: (902) 491-6356 Email: stress@smu.ca
Faculty Supervisor: Dr. Lucie Kocum

The purpose of this study is to better understand why individuals experience stress in their workplace. This study will examine a new workplace stress model with a working population.

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There is no danger of physical or social risk to you as a consequence of your participation in this study. Some aspects of the study may cause you some discomfort or stress. We also ask that you notify us at 902-491-6356 or by email at stress@smu.ca if you experience any discomfort during or after the survey. You will be provided with a list of services that you can consult. You may withdraw your consent at any time without penalty and you may choose to skip questions that you do not feel comfortable answering. If you wish to withdraw any previously submitted responses, please email us at stress@smu.ca.

You will be compensated from this study with a tailored report. After completing Week 5's survey, a report will be generated outlining your fluctuating work demands, resources, and personal outcomes.

All information you provide will be stored online with a survey-host, Qualtrics and on a password-protected computer. Qualtrics encrypts and stores data in Ireland. Data stored online will not be shared by Qualtrics to any third parties. The computer transferred data will be retained for a minimum of 5 years after publication. Individual information will not be shared outside the research team and results will be reported in aggregate (group level) form only. The information you provide will be used to understand stress in the workplace as well as to help formulate future research ideas and directions. Moreover, it is anticipated that the findings of this study will be presented to the scientific community through conferences, scientific papers, newsletters, brochures, and workshops.

If you should have further questions about this study, please contact our research team by phoning (902) 491-6356 or email the Principal Investigator at stress@smu.ca. If you would like to be informed of the results of this study, please contact us at stress@smu.ca in January 2016.

This research has been reviewed and approved by the Saint Mary's University Research Ethics Board. If you have any questions or concerns about ethical matters pertaining to this study, you may contact the Chair of the Saint Mary's University Research Ethics Board at ethics@smu.ca or 902-420-5728.

FEEDBACK FORM
(REB File # 15-214)

Thank-you for completing the work stress survey. This aim of this study is to examine the role that basic need satisfaction (need for competence, need for autonomy, and need for relatedness) has on individual's experience of stress at work. The findings of this study will provide preliminary results to why individuals may experience stress at work. These results will be used to further the academic literature on the subject and to promote workplace initiatives to decrease employee's stress. Therefore, these results will be used to help better understand stress in the workplace both theoretically and practically.

If you experienced any discomfort during the survey please refer to your family doctor, your Employee Assistance Program or a local mental health crisis line. If you live in Canada you can also refer to the resources below or call 811:

Canadian Mental Health Association <http://www.cmha.ca/mental-health/find-help/>

Provincial and Territorial Psychological Associations
<http://www.cpa.ca/public/whatisapsychologist/PTassociations/>

If you have any other questions, please do not hesitate to call (902) 420-5846 or email us stress@smu.ca. If you would like to be informed of the results of this study, please contact us in January 2018.

We are also interested to look at the long term effects of stress at work. If you are interested in being contacted in 6 months' time, please provide your email address

_____.

Appendix B**Monte Carlo Simulation Power Analysis***Mplus Monte Carlo Simulation for Power Analysis for Study 1*

TITLE: Florko Power Analysis no missing;

MONTECARLO:

NAMES ARE wDEM bDEM wRES bRES wDxR bDxR wBNS bBNS
wNSxR bNSxR wMBI bMBI wPHQ bPHQ wMHI bMHI;

NOBSERVATIONS = 350;

NREPS = 100;

NCSIZES = 1;

CSIZES = 70 (5);

WITHIN = wDEM wRES wDxR wBNS wNSxR wMBI wPHQ wMHI;

BETWEEN = bDEM bRES bDxR bBNS bNSxR bMBI bPHQ bMHI;

REPSAVE = ALL;

SAVE = FlorkoPower.rep*.dat;

MODEL POPULATION:

% WITHIN%

wDEM@1;

a | wMBI ON wDEM; !c

b | wPHQ ON wDEM; !c

c | wMHI ON wDEM; !c

d | wMBI ON wRES; !c

e | wPHQ ON wRES; !c

f | wMHI ON wRES; !c

g | wMBI ON wDxR; !c

h | wPHQ ON wDxR; !c

i | wMHI ON wDxR; !c

j | wMBI ON wNSxR; !c

k | wPHQ ON wNSxR; !c

l | wMHI ON wNSxR; !c

m | wMBI ON wBNS; !b

n | wPHQ ON wBNS; !b

o | wMHI ON wBNS; !b

x | wBNS ON wDEM; !a

y | wBNS ON wRES; !a

z | wBNS ON wDxR; !a

wBNS*1;
 wMBI*1;
 wPHQ*1;
 wMHI*1;

%BETWEEN%

bMBI WITH bBNS*0.1 m*0.1 n*0.1 o*0.1 x*0.1 y*0.1 z*0.1 a*0.1 b*0.1
 c*0.1 d*0.1 e*0.1 f*0.1 g*0.1 h*0.1 i*0.1 j*0.1 k*0.1 l*0.1;
 bPHQ WITH bBNS*0.1 m*0.1 n*0.1 o*0.1 x*0.1 y*0.1 z*0.1 a*0.1 b*0.1
 c*0.1 d*0.1 e*0.1 f*0.1 g*0.1 h*0.1 i*0.1 j*0.1 k*0.1 l*0.1;
 bMHI WITH bBNS*0.1 m*0.1 n*0.1 o*0.1 x*0.1 y*0.1 z*0.1 a*0.1 b*0.1
 c*0.1 d*0.1 e*0.1 f*0.1 g*0.1 h*0.1 i*0.1 j*0.1 k*0.1 l*0.1;
 bBNS WITH m*0.1 n*0.1 o*0.1 x*0.1 y*0.1 z*0.1 a*0.1 b*0.1 c*0.1
 c*0.1 d*0.1 e*0.1 f*0.1 g*0.1 h*0.1 i*0.1 j*0.1 k*0.1 l*0.1;

x WITH m*0.1 (xm);
 y WITH m*0.1 (ym);
 z WITH m*0.1 (zm);
 x WITH n*0.1 (xn);
 y WITH n*0.1 (yn);
 z WITH n*0.1 (zn);
 x WITH o*0.1 (xo);
 y WITH o*0.1 (yo);
 z WITH o*0.1 (zo);

x WITH a*0.1;
 y WITH a*0.1;
 z WITH a*0.1;
 x WITH b*0.1;
 y WITH b*0.1;
 z WITH b*0.1;
 x WITH c*0.1;
 y WITH c*0.1;
 z WITH c*0.1;
 x WITH d*0.1;
 y WITH d*0.1;
 z WITH d*0.1;
 x WITH e*0.1;
 y WITH e*0.1;
 z WITH e*0.1;
 x WITH f*0.1;
 y WITH f*0.1;
 z WITH f*0.1;
 x WITH g*0.1;
 y WITH g*0.1;

z WITH g*0.1;
x WITH h*0.1;
y WITH h*0.1;
z WITH h*0.1;
x WITH i*0.1;
y WITH i*0.1;
z WITH i*0.1;
x WITH j*0.1;
y WITH j*0.1;
z WITH j*0.1;
x WITH k*0.1;
y WITH k*0.1;
z WITH k*0.1;
x WITH l*0.1;
y WITH l*0.1;
z WITH l*0.1;

m WITH a*0.1;
n WITH a*0.1;
o WITH a*0.1;
m WITH b*0.1;
n WITH b*0.1;
o WITH b*0.1;
m WITH c*0.1;
n WITH c*0.1;
o WITH c*0.1;
m WITH d*0.1;
n WITH d*0.1;
o WITH d*0.1;
m WITH e*0.1;
n WITH e*0.1;
o WITH e*0.1;
m WITH f*0.1;
n WITH f*0.1;
o WITH f*0.1;
m WITH g*0.1;
n WITH g*0.1;
o WITH g*0.1;
m WITH h*0.1;
n WITH h*0.1;
o WITH h*0.1;
m WITH i*0.1;
n WITH i*0.1;
o WITH i*0.1;
m WITH j*0.1;

n WITH j*0.1;
 o WITH j*0.1;
 m WITH k*0.1;
 n WITH k*0.1;
 o WITH k*0.1;
 m WITH l*0.1;
 n WITH l*0.1;
 o WITH l*0.1;

bMBI*1 bPHQ*1 bMHI*1 bBNS*1 a*1 b*1 c*1 d*1 e*1 f*1 g*1
 h*1 i*1 j*1 k*1 l*1 m*1 n*1 o*1 x*1 y*1 z*1;
 [x*-0.15] (NSd); !van der Broeck et al., 2008
 [y*0.86] (NSr); !van der Broeck et al., 2008
 [z*-0.13] (NSx); !van der Broeck et al., 2008
 [m*-0.32] (NSb); !van der Broeck et al., 2008
 [n*-0.27] (NSp); !estimate based on average
 [o*-0.24] (NSm); !Talley et al., 2012 & Boudrais et al., 2011
 [a*0.77]; !Bakker et al., 2003 & van der Broeck et al., 2008
 [b*0.57]; !estimate based on average
 [c*0.14]; !estimate from average of Edwards & Van Harrison 2008
 [d*-0.27]; !Bakker et al., 2003
 [e*-0.25]; !Bakker et al., 2003
 [f*-0.86]; !van der Broeck et al., 2008
 [g*-0.14]; !Bakker et al., 2003
 [h*-0.14]; !Bakker et al., 2003
 [i*-0.21]; !Boudrais et al., 2011
 [j*-0.28]; !van der Broeck et al., 2008
 [k*-0.23]; !estimate based on average
 [l*-0.18]; !estimate based on average

ANALYSIS: TYPE = TWOLEVEL RANDOM;

MODEL:

```
% WITHIN%
wDEM@1;
a | wMBI ON wDEM; !c
b | wPHQ ON wDEM; !c
c | wMHI ON wDEM; !c
d | wMBI ON wRES; !c
e | wPHQ ON wRES; !c
f | wMHI ON wRES; !c
g | wMBI ON wDxR; !c
h | wPHQ ON wDxR; !c
```

i | wMHI ON wDxR; !c
 j | wMBI ON wNSxR; !c
 k | wPHQ ON wNSxR; !c
 l | wMHI ON wNSxR; !c

m | wMBI ON wBNS; !b
 n | wPHQ ON wBNS; !b
 o | wMHI ON wBNS; !b

x | wBNS ON wDEM; !a
 y | wBNS ON wRES; !a
 z | wBNS ON wDxR; !a

wBNS*1;
 wMBI*1;
 wPHQ*1;
 wMHI*1;

%BETWEEN%

bMBI WITH bBNS*0.1 m*0.1 n*0.1 o*0.1 x*0.1 y*0.1 z*0.1 a*0.1 b*0.1
 c*0.1 d*0.1 e*0.1 f*0.1 g*0.1 h*0.1 i*0.1 j*0.1 k*0.1 l*0.1;
 bPHQ WITH bBNS*0.1 m*0.1 n*0.1 o*0.1 x*0.1 y*0.1 z*0.1 a*0.1 b*0.1
 c*0.1 d*0.1 e*0.1 f*0.1 g*0.1 h*0.1 i*0.1 j*0.1 k*0.1 l*0.1;
 bMHI WITH bBNS*0.1 m*0.1 n*0.1 o*0.1 x*0.1 y*0.1 z*0.1 a*0.1 b*0.1
 c*0.1 d*0.1 e*0.1 f*0.1 g*0.1 h*0.1 i*0.1 j*0.1 k*0.1 l*0.1;
 bBNS WITH m*0.1 n*0.1 o*0.1 x*0.1 y*0.1 z*0.1 a*0.1 b*0.1 c*0.1
 c*0.1 d*0.1 e*0.1 f*0.1 g*0.1 h*0.1 i*0.1 j*0.1 k*0.1 l*0.1;

x WITH m*0.1 (xm);
 y WITH m*0.1 (ym);
 z WITH m*0.1 (zm);
 x WITH n*0.1 (xn);
 y WITH n*0.1 (yn);
 z WITH n*0.1 (zn);
 x WITH o*0.1 (xo);
 y WITH o*0.1 (yo);
 z WITH o*0.1 (zo);

x WITH a*0.1;
 y WITH a*0.1;
 z WITH a*0.1;
 x WITH b*0.1;
 y WITH b*0.1;
 z WITH b*0.1;
 x WITH c*0.1;

y WITH c*0.1;
z WITH c*0.1;
x WITH d*0.1;
y WITH d*0.1;
z WITH d*0.1;
x WITH e*0.1;
y WITH e*0.1;
z WITH e*0.1;
x WITH f*0.1;
y WITH f*0.1;
z WITH f*0.1;
x WITH g*0.1;
y WITH g*0.1;
z WITH g*0.1;
x WITH h*0.1;
y WITH h*0.1;
z WITH h*0.1;
x WITH i*0.1;
y WITH i*0.1;
z WITH i*0.1;
x WITH j*0.1;
y WITH j*0.1;
z WITH j*0.1;
x WITH k*0.1;
y WITH k*0.1;
z WITH k*0.1;
x WITH l*0.1;
y WITH l*0.1;
z WITH l*0.1;

m WITH a*0.1;
n WITH a*0.1;
o WITH a*0.1;
m WITH b*0.1;
n WITH b*0.1;
o WITH b*0.1;
m WITH c*0.1;
n WITH c*0.1;
o WITH c*0.1;
m WITH d*0.1;
n WITH d*0.1;
o WITH d*0.1;
m WITH e*0.1;
n WITH e*0.1;
o WITH e*0.1;

m WITH f*0.1;
 n WITH f*0.1;
 o WITH f*0.1;
 m WITH g*0.1;
 n WITH g*0.1;
 o WITH g*0.1;
 m WITH h*0.1;
 n WITH h*0.1;
 o WITH h*0.1;
 m WITH i*0.1;
 n WITH i*0.1;
 o WITH i*0.1;
 m WITH j*0.1;
 n WITH j*0.1;
 o WITH j*0.1;
 m WITH k*0.1;
 n WITH k*0.1;
 o WITH k*0.1;
 m WITH l*0.1;
 n WITH l*0.1;
 o WITH l*0.1;

bMBI*1 bPHQ*1 bMHI*1 bBNS*1 a*1 b*1 c*1 d*1 e*1 f*1 g*1
 h*1 i*1 j*1 k*1 l*1 m*1 n*1 o*1 x*1 y*1 z*1;
 [x*-0.15] (NSd); !van der Broeck et al., 2008
 [y*0.86] (NSr); !van der Broeck et al., 2008
 [z*-0.13] (NSx); !van der Broeck et al., 2008
 [m*-0.32] (NSb); !van der Broeck et al., 2008
 [n*-0.27] (NSp); !estimate based on average
 [o*-0.24] (NSm); !Talley et al., 2012 & Boudrais et al., 2011
 [a*0.77]; !Bakker et al., 2003 & van der Broeck et al., 2008
 [b*0.57]; !estimate based on average
 [c*0.14]; !estimate from average of Edwards & Van Harrison 2008
 [d*-0.27]; !Bakker et al., 2003
 [e*-0.25]; !Bakker et al., 2003
 [f*-0.86]; !van der Broeck et al., 2008
 [g*-0.14]; !Bakker et al., 2003
 [h*-0.14]; !Bakker et al., 2003
 [i*-0.21]; !Boudrais et al., 2011
 [j*-0.28]; !van der Broeck et al., 2008
 [k*-0.23]; !estimate based on average
 [l*-0.18]; !estimate based on average

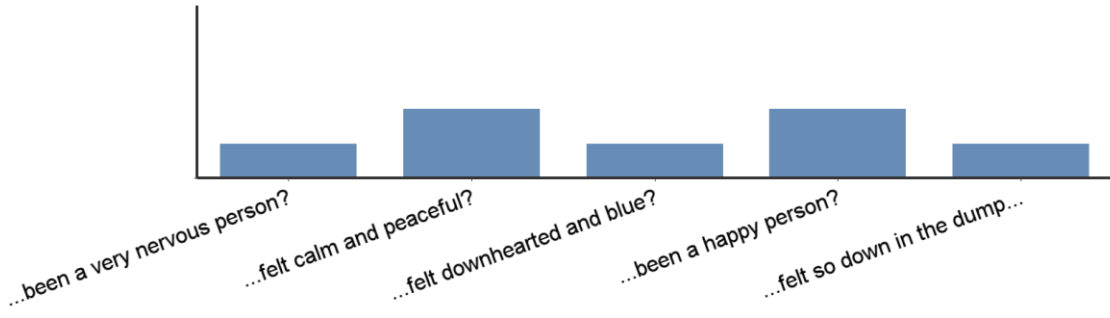
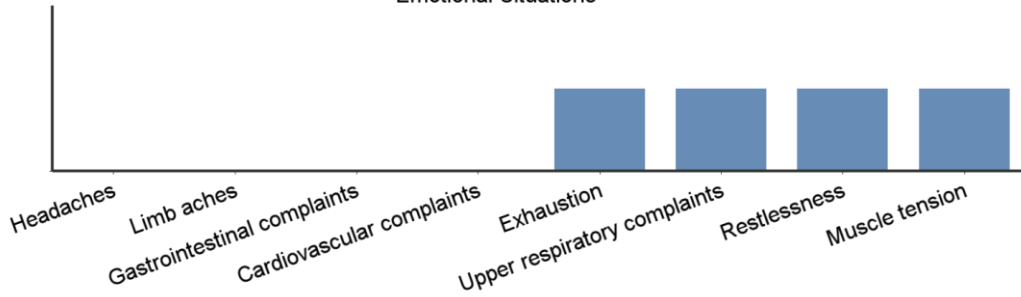
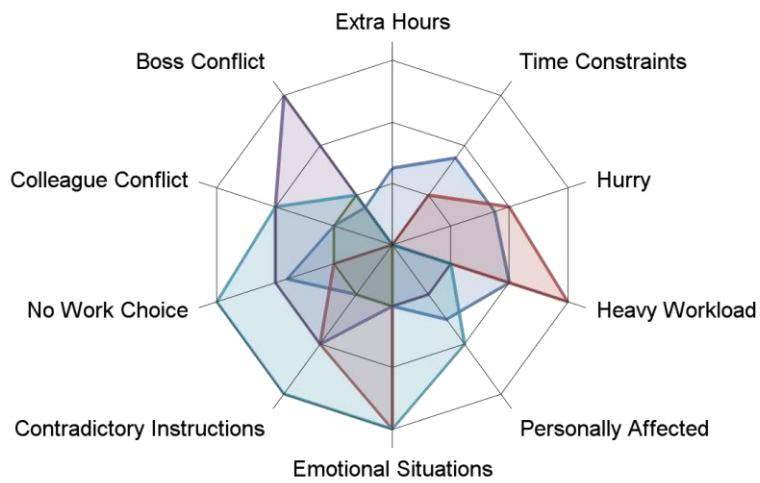
Appendix C

Participant Report

Below shows your work demands across all 5 weeks. The larger the area covered the more often the demand is experienced. Below also shows the physical and psychological symptoms experienced this week.

Research suggests that more demands is associated with more ill health symptoms.

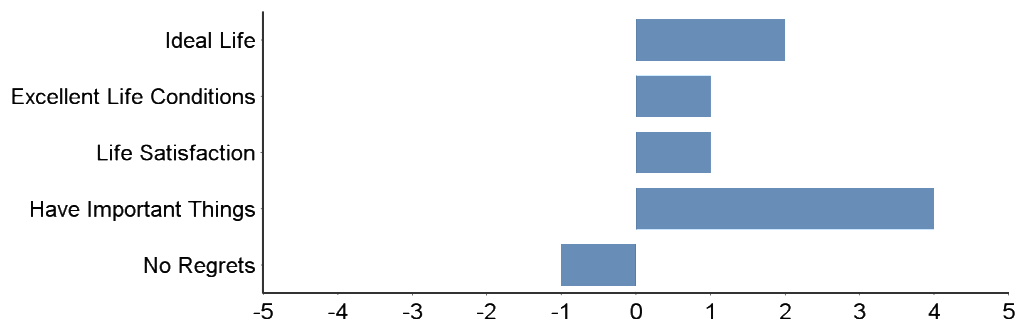
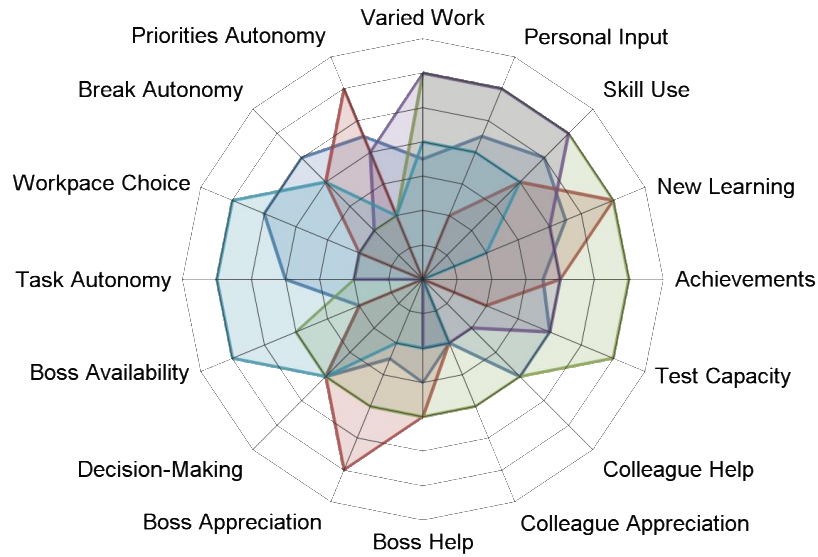
■ Week 1 ■ Week 2 ■ Week 3 ■ Week 4 ■ Week 5



Below shows the work resources across all 5 weeks. The larger the area covered the more resources you have. Below also shows your job and life satisfaction experienced this week.

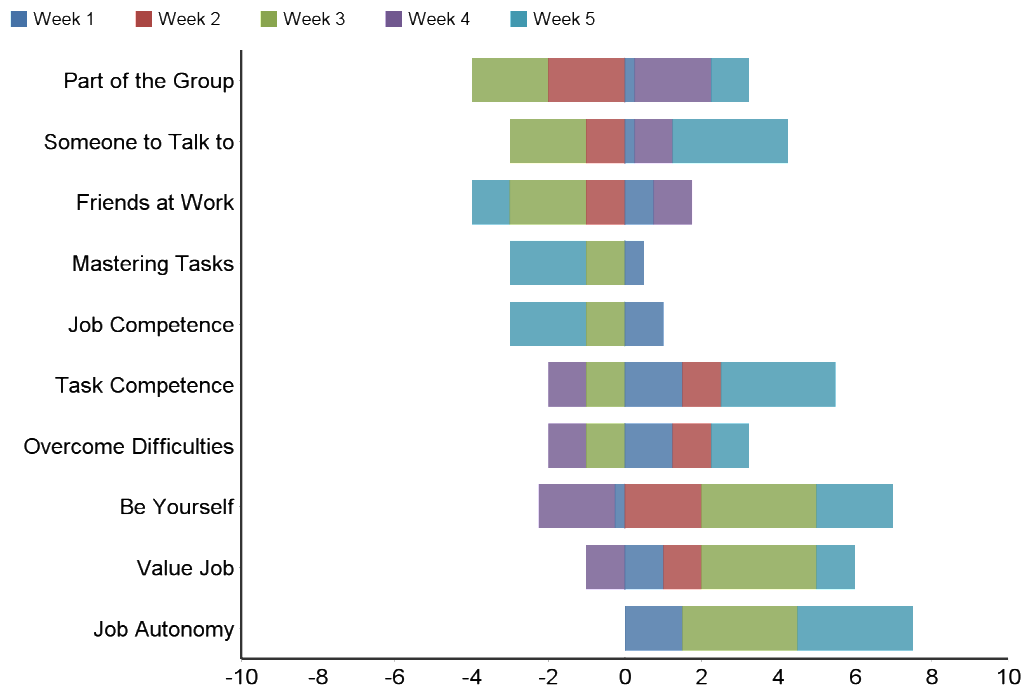
Research suggests that more resources are associated with more job and life satisfaction.

■ Week 1 ■ Week 2 ■ Week 3 ■ Week 4 ■ Week 5



We hypothesize that the impact of demands on strain and ill health symptoms are associated with the satisfaction of the following needs.

Below shows how each of these needs are satisfied across all five weeks. The farther the bars are to the right, the more satisfied this need is.



Appendix D

Demographics

Gender

- Male
- Female
- Other

How old are you? _____

What are your ethnic or cultural origins of your ancestors?

- Caucasian
- African-Descent
- Hispanic
- East Asian (e.g., Chinese, Japanese, Korean)
- South Asian (e.g., East Indian, Pakistani)
- Middle Eastern/West Asian
- Aboriginal/First Nations
- Mixed
- Other _____

What is your current country of residence? _____

What is your native tongue (i.e., primary language)?

- English
- French
- Other _____

What is your legal marital status?

- Married, common-law spouse
- Separated, but still legally married
- Divorced
- Widowed
- Single (never legally married)

Are you responsible for any dependants? (for example: children, elderly relatives, ill spouse, etc.)

- No
- Yes

If yes, how many?

- Children _____
 Elderly Parents/Relatives _____
 Ill Spouse _____
 Other _____

How would you describe your socioeconomic status?

- Lower socioeconomic status (e.g., low current household income, low parental household income, unskilled occupation)
 Average socioeconomic status (e.g., average current household income, average parental household income, semi-skilled occupation)
 High socioeconomic status (e.g., high current household income, high parental household income, skilled occupation)

What is your annual income? _____

What is your annual household income? _____

What is your employment status?

- Work full time
 Work part time
 Contract/Casual employee
 Self-employed
 Unemployed

Do you work for a public or private organization?

- Government
 Privately-owned organization
 Publicly-funded organization (e.g., school, hospital, university)
 Publicly-traded organization
 Other _____

Do you work shift work?

- No
 Yes

If yes, which of the following best describes your usual work schedule?

- Day shift (e.g., 6:00 am to 2:00 pm)
 Afternoon shift (e.g., 2:00 pm to 10:00 pm)
 Night shift (e.g., 10:00 pm to 6:00 am)
 Split shift
 Irregular shift/on-call
 Rotating shifts/hours

How many hours a week do you work? _____

How large is your organization?

- Under 20 people
- 20-49 people
- 50-100 people
- 100-499 people
- 500-999 people
- 1,000-4,999 people
- 5,000-9,999 people
- 10,000+ people

Do you have direct reports (e.g., are you a supervisor/manager)?

- No
- Yes

In what industry do you work in?

- Agriculture
- Forestry
- Fishing
- Mining
- Oil & Gas
- Utilities
- Construction
- Manufacturing
- Trade
- Transportation & Warehousing
- Finance
- Insurance
- Real Estate
- Business
- Education
- Health Care & Social Assistance
- Arts & Culture
- Accommodation & Foods Services
- Public Administration
- Other _____

What department do you work in within your organization? _____

What is your job title or occupation? _____

How long have you worked at your current position/title (in years)? _____

How long have you worked for your current employer (in years)? _____

Approximately, what is the ratio of females to males in your immediate workgroup (i.e., the colleagues you work with regularly or nearly every day)?

- All females
- All males
- About equal females and males
- Mostly females
- Mostly males

	Never	Rarely	Sometimes	Often
How often do the demands of your job interfere with your personal/family life?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often do the demands of your personal/family life interfere with your work on the job?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Appendix E

Questionnaire on the Experience and Evaluation of Work (VBBA)

Demands

Think about your job over the past week. Please indicate how often you have experienced the following situations at work **within the past week**. Try to respond to each question. If the question does not apply to your particular job, indicate n/a (not applicable) rather than leaving the question blank.

		Never	Sometimes	Often	Always	n/a
Pace at Work	Do you have to work extra hard in order to complete something	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Do you work under time constraints?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Do you have to hurry at work?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Emotional Workload	Is your work load heavy from an emotional viewpoint?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Are you confronted in your work with elements which affect you personally?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Does your work put you in emotional situations?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Role Conflict	Do you receive contradictory instructions?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Do you have to do your work in a way which differs from the method of your choice?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Do you have conflict with your colleagues about the content of your tasks?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Do you have conflict with your direct boss about the content of your tasks?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Role Ambiguity	Do you know exactly what other people expect of you in your work?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Do you know exactly what your tasks are?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Do you know exactly what you can expect from other people in your department?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Resources

Think about your job over the past week. Please indicate how often you have experienced the following situations at work **within the past week**. Try to respond to each question. If the question does not apply to your particular job, indicate n/a (not applicable) rather than leaving the question blank.

		Never	Sometimes	Often	Always	n/a
Skill Variety	Is your work varied?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Does your work require personal input?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Does your work make sufficient on your skills and capacities?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Skill Use	Do you learn new things in your work?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Does your work give you the impression that you achieve something?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Does your work make sufficient demands on your skills and capacities?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social Support	If necessary, can you ask your colleagues for help?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	In your work, do you feel appreciated by your colleagues?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	If necessary, can you ask your direct boss for help?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Participation	In your work, do you feel appreciated by your direct boss?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Can you participate in decisions affecting areas related to your work?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Can you consult satisfactorily with your direct boss about your work?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Autonomy	Can you participate in deciding what does and what does not pertain to your tasks?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Do you have an influence on the pace of work?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Can you interrupt your work if you find it necessary to do so?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Can you decide on the order of priorities for your work activities?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Appendix F

Basic Needs Satisfaction at Work Scale (BNS-W)

Think about your job over the past week. Please indicate to what degree you agree or disagree with the following situations at work **within the past week**. Try to respond to each question

	Totally Disagree	Disagree	Neither Disagree Nor Agree	Agree	Totally Agree
I don't really feel connected with other people at my job	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
At work, I feel part of a group	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't really mix with other people at my job	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
At work, I can talk with people about things that really matter to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I often feel alone when I am with my colleagues	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Some people I work with are close friends of mine.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't really feel competent in my job	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I really master my tasks at my job	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel competent at my job	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I doubt whether I am able to execute my job properly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am good at the things I do in my job	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have the feeling that I can even accomplish the most difficult tasks at work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel like I can be myself at my job	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
At work, I often feel like I have to follow other people's commands	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I could choose, I would do things at work differently	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The tasks I have to do at work are in line with what I really want to do	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel free to do my job the way I think it could best be done	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In my job, I feel forced to do things I do not want to do	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Appendix H**Giessen Subjective Complaints List**

Have you experienced any of these complaints this week?

	No	Yes
Headaches	<input type="radio"/>	<input type="radio"/>
Limb aches	<input type="radio"/>	<input type="radio"/>
Gastrointestinal complaints	<input type="radio"/>	<input type="radio"/>
Cardiovascular complaints	<input type="radio"/>	<input type="radio"/>
Exhaustion	<input type="radio"/>	<input type="radio"/>
Upper respiratory complaints	<input type="radio"/>	<input type="radio"/>
Restlessness	<input type="radio"/>	<input type="radio"/>
Muscle tension	<input type="radio"/>	<input type="radio"/>

Appendix J

Hypothesized Multilevel Structural Equation Model

TITLE: 1-1-1 mediation (MSEM)

DATA: FILE IS "\Users\laure\Dropbox\Thesis\
Lauren Lucie Thesis\Analyses\Group1.dat";

VARIABLE: NAMES ARE ID Company Gender Marital SES Shift
bWH bDEM bRES bBNS Time MBI GSC MHI
WWH WDEM WRES WBNS BDxR WDxR BBxR WBxR;
MISSING ARE ALL (-99);

USEVARIABLES ARE ID Gender Shift SES bWH
bDEM bRES bBNS MBI GSC MHI wWH
WDEM WRES WBNS BDxR WDxR BBxR WBxR;
CLUSTER IS ID; ! Level-2 grouping identifier
WITHIN ARE wWH WDEM WRES WBNS WDxR WBxR;
BETWEEN ARE BDEM BRES BBNS BDxR BBxR
bWH Gender Shift SES;

ANALYSIS: TYPE IS TWOLEVEL;

MODEL:

```
% WITHIN% ! Model for Within effects follows
WBNS ON WDEM(wa1); ! regress m on x
WBNS ON WRES(wa2); ! regress m on x
WBNS ON WDxR(wa3); ! regress m on x
WBNS ON WWH; ! regress m on x
MBI ON WBNS(wb1); ! regress y on m
MBI ON WBxR(wb2); ! regress y on m
MBI ON WDEM; ! regress y on x
MBI ON WRES; ! regress y on x
MBI ON WDxR; ! regress y on x
MBI ON WWH; ! regress y on x
GSC ON WBNS(wb3); ! regress y on m
GSC ON WBxR(wb4); ! regress y on m
GSC ON WDEM; ! regress y on x
GSC ON WRES; ! regress y on x
GSC ON WDxR; ! regress y on x
GSC ON WWH; ! regress y on x
MHI ON WBNS(wb5); ! regress y on m
MHI ON WBxR(wb6); ! regress y on m
MHI ON WDEM; ! regress y on x
```

MHI ON WRES; ! regress y on x
 MHI ON WDxR; ! regress y on x
 MHI ON WWH; ! regress y on x

%BETWEEN% ! Model for Between effects follows

BBNS ON BDEM(ba1); ! regress m on x
 BBNS ON BRES(ba2); ! regress m on x
 BBNS ON BDxR(ba3); ! regress m on x

BBNS ON Gender;

BBNS ON Shift;

BBNS ON SES;

BBNS ON bWH;

MBI ON BBNS(bb1); ! regress y on m

MBI ON BBxR(bb2); ! regress y on m

MBI ON BDEM; ! regress y on x

MBI ON BRES; ! regress y on x

MBI ON BDxR; ! regress y on x

MBI ON Gender;

MBI ON Shift;

MBI ON SES;

MBI ON bWH;

GSC ON BBNS(bb3); ! regress y on m

GSC ON BBxR(bb4); ! regress y on m

GSC ON BDEM; ! regress y on x

GSC ON BRES; ! regress y on x

GSC ON BDxR; ! regress y on x

GSC ON Gender;

GSC ON Shift;

GSC ON SES;

GSC ON bWH;

MHI ON BBNS(bb5); ! regress y on m

MHI ON BBxR(bb6); ! regress y on m

MHI ON BDEM; ! regress y on x

MHI ON BRES; ! regress y on x

MHI ON BDxR; ! regress y on x

MHI ON Gender;

MHI ON Shift;

MHI ON SES;

MHI ON bWH;

MODEL CONSTRAINT:

NEW(indw1 indw2 indw3 indw4 indw5 indw6
 indw7 indw8 indw9 indw10 indw11 indw12
 indw13 indw14 indw15 indw16 indw17 indw18
 indb1 indb2 indb3 indb4 indb5 indb6

indb7 indb8 indb9 indb10 indb11 indb12
indb13 indb14 indb15 indb16 indb17 indb18);
indw1 = wa1*wb1;
indw2 = wa2*wb1;
indw3 = wa3*wb1;
indw4 = wa1*wb2;
indw5 = wa2*wb2;
indw6 = wa3*wb2;
indw7 = wa1*wb3;
indw8 = wa2*wb3;
indw9 = wa3*wb3;
indw10 = wa1*wb4;
indw11 = wa2*wb4;
indw12 = wa3*wb4;
indw13 = wa1*wb5;
indw14 = wa2*wb5;
indw15 = wa3*wb5;
indw16 = wa1*wb6;
indw17 = wa2*wb6;
indw18 = wa3*wb6;
indb1 = ba1*bb1;
indb2 = ba2*bb1;
indb3 = ba3*bb1;
indb4 = ba1*bb2;
indb5 = ba2*bb2;
indb6 = ba3*bb2;
indb7 = ba1*bb3;
indb8 = ba2*bb3;
indb9 = ba3*bb3;
indb10 = ba1*bb4;
indb11 = ba2*bb4;
indb12 = ba3*bb4;
indb13 = ba1*bb5;
indb14 = ba2*bb5;
indb15 = ba3*bb5;
indb16 = ba1*bb6;
indb17 = ba2*bb6;
indb18 = ba3*bb6;

OUTPUT: CINTERVAL SAMPSTAT
TECH1 TECH5 STANDARDIZED;